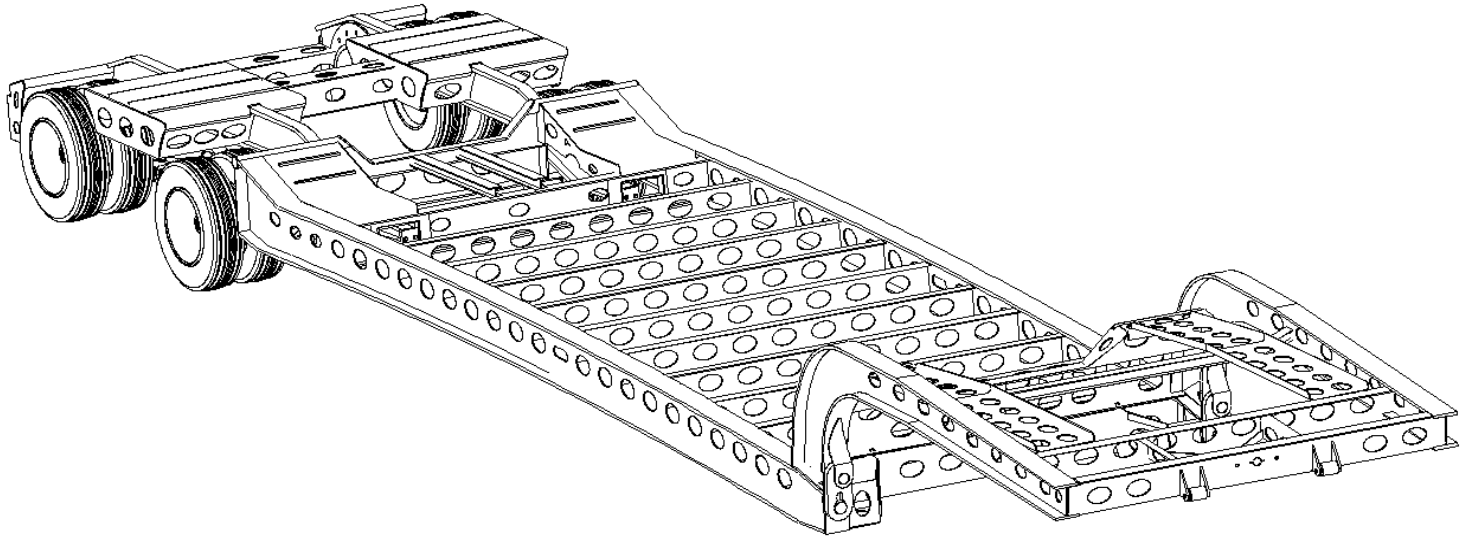
Rackley
BILT CUSTOM TRAILERS
4350 Newton Road Stockton ,Ca 95205
Ph: 209 948 8586 Fax: 209 948 0452

5 axle owners manual



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Rackley Bilt Custom Trailers Warranty:

With the purchase of a new Rackley trailer we provide a 30 day all inclusive warranty and 12 months on products manufactured by us. If within 30 days you should have a problem with any part of the trailer you can bring it back to our facility for repair. After the 30 days our remaining warranty covers only the workmanship and/or materials that were originally manufactured by Rackley Bilt . All repairs required within this time shall be subject to approval at our facility. Transportation of trailers to our facility is not covered in the warranty and is the sole responsibility of the trailer owner. This warranty shall be limited to repair/replacement of components manufactured by Rackley Bilt at our discretion . Under no circumstance will Rackley Bilt Customs trailers be responsible for any lost revenue ,damages , or injury . Please be aware that each individual product manufacture may have a warranty that varies from our warranty , in which case it would then be addressed by the respective product manufacturer (i.e. wheels , lights , bearings ,etc…) . If at any point in the warranty period the trailer should receive any unauthorized structural repair and /or loads beyond the rating of the trailer all warranties shall become null and void .

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Please take a moment to read through the manual and get familiar with your new trailer. All operators / helpers should be qualified and/or supervised at all times when working on and around the expando to ensure the safety of themselves as well as others . If after reading this manual you should have any questions, we can be contacted at the above phone number and address.

1. Under no circumstances should you load / have a load on the neck of the trailer without the tractor attached.(neck needs to be supported)

2. When loading/unloading trailer make sure all bystanders are at a safe distance.

3. If necessary to have a spotter near the trailer when loading make sure to keep feet from underneath trailer as heavy loads may cause trailers to drop causing injury.e

4. When trailer is to be opened/closed make sure all people and misc items(i.e. chains and pry bars) are clear from slide boxes and tires.

5. Before each load the driver should inspect the trailer for any damage .This would include all lights working properly,no leaking air lines and no structural damage is evident .

6. Parking should be done on flat ground only. When the trailer has no air ,it also has no brakes to prevent it from rolling .

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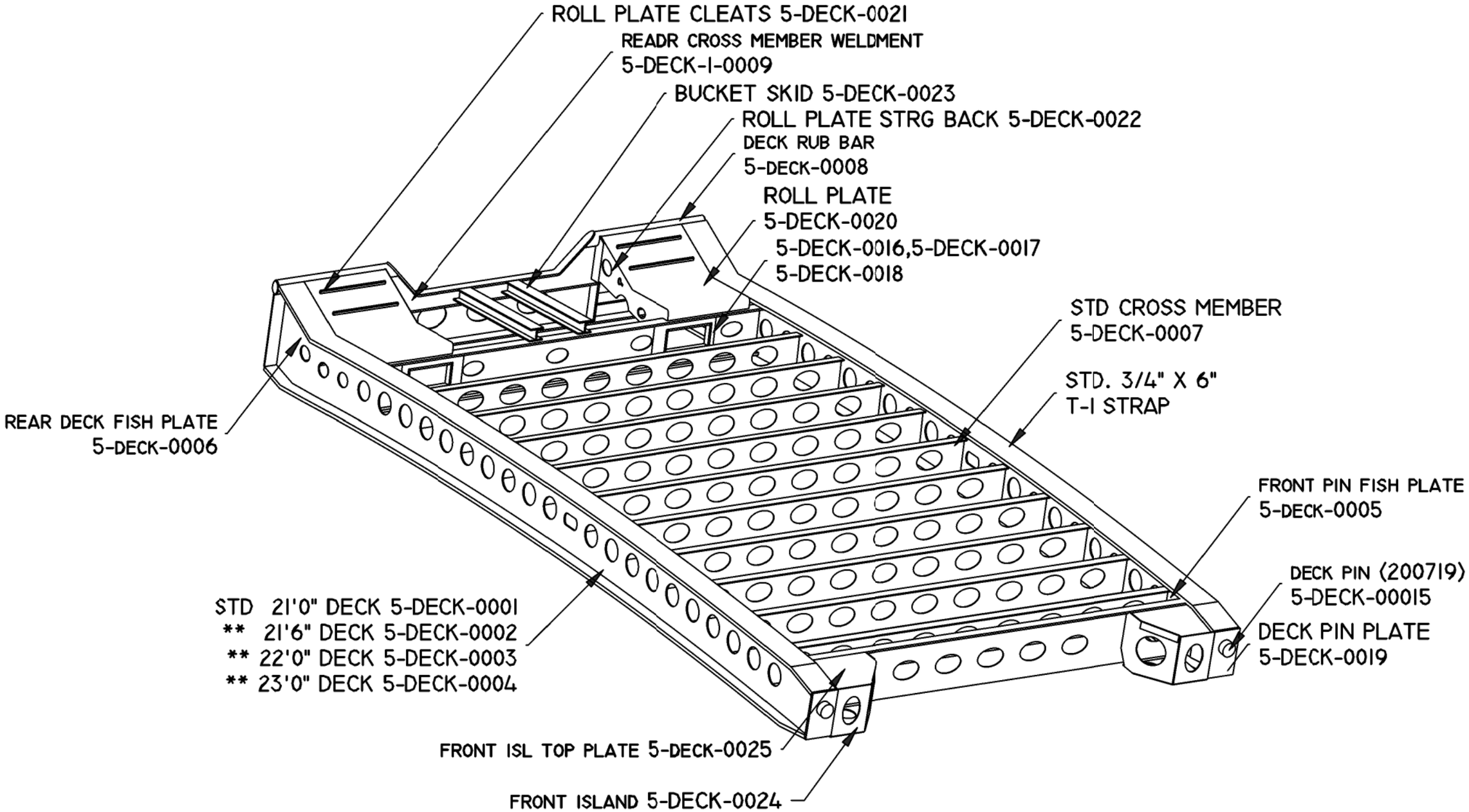
Lubrication

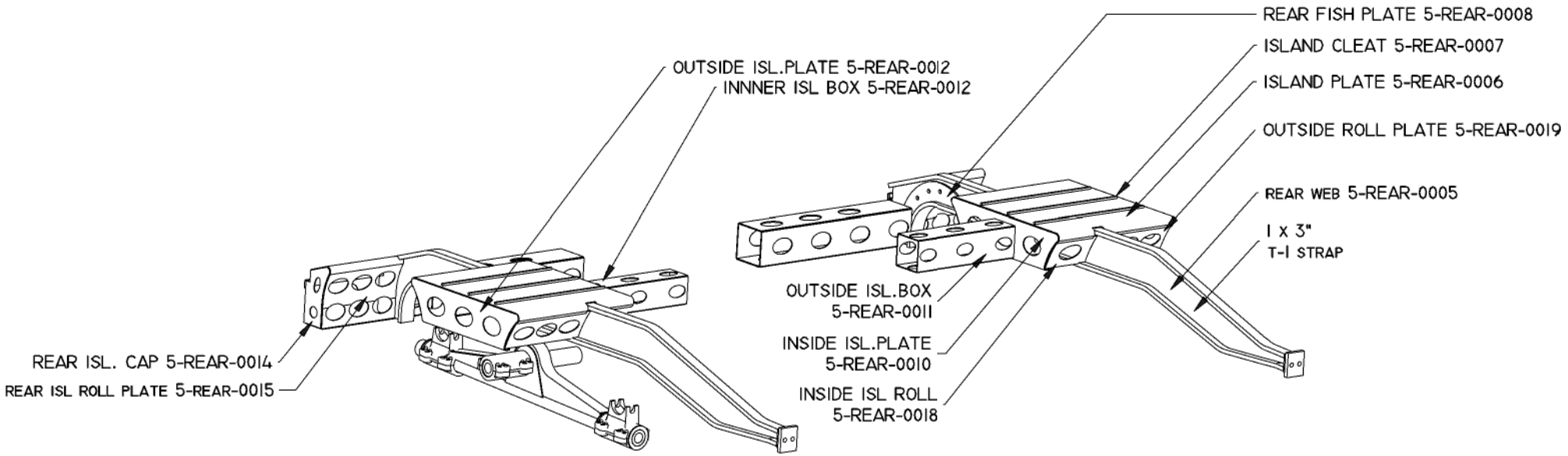
1. Check oil level in hubs on a regular basis .At this time it would be a good idea to inspect the condition of hubs for cracks and leaking seals. If the hubs should require oil simply remove rubber plug and refill with 85w/140 gear oil to fill line.
2. On monthly intervals (or as needed in extreme environments) we recommend greasing the S-Cam bushing to extend component life and quality of brake accuation.
3. On monthly intervals it is recommended to check/refill the inline lubricator. Doing so will minimize detrimental corrosion and wear to the pneumatic components on the trailer. As a trailer ages it may necessitate more oil thus requiring more frequent oil inspection .*To check oil level of lubricator* , (**SMC P/N AL30-N03-Z**) you will find 4 “windows” for viewing fluid level . To remove bowl simply pull black tab down with thumb and rotate bowl 45° while pulling down on the bowl . Fill with hydraulic oil or pneumatic tool oil then replace bowl.

Expanding the expando

There are 2 options methods for the opening / closing of our trailer.

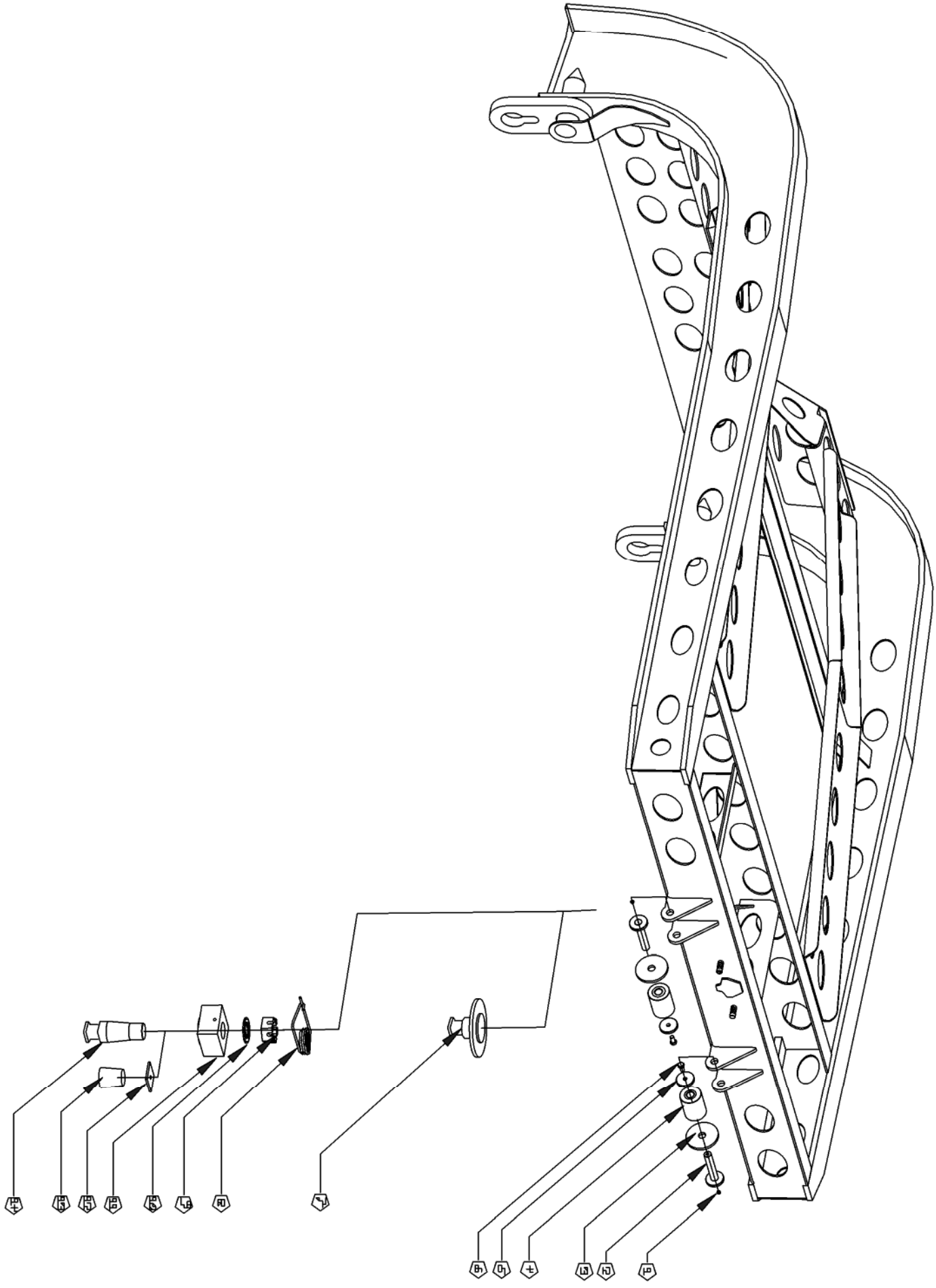
1.Manually ,the driver can actuate the air valve and drive a short distance prior to loading .
3.With the use of our optional remote actuator valve the driver can open/close the trailer without the need to exit the truck .


ROLL PLATE CLEATS 5-DECK-0021
READR CROSS MEMBER WELDMENT
5-DECK-I-0009
BUCKET SKID 5-DECK-0023
ROLL PLATE STRG BACK 5-DECK-0022
DECK RUB BAR
5-DECK-0008
ROLL PLATE
5-DECK-0020
5-DECK-0016,5-DECK-0017
5-DECK-0018
STD CROSS MEMBER
5-DECK-0007
STD. 3/4" X 6"
T-I STRAP
REAR DECK FISH PLATE
5-DECK-0006
FRONT PIN FISH PLATE
5-DECK-0005
DECK PIN (200719)
5-DECK-00015
DECK PIN PLATE
5-DECK-0019
STD 21'0" DECK 5-DECK-0001
** 21'6" DECK 5-DECK-0002
** 22'0" DECK 5-DECK-0003
** 23'0" DECK 5-DECK-0004
FRONT ISL TOP PLATE 5-DECK-0025
FRONT ISLAND 5-DECK-0024

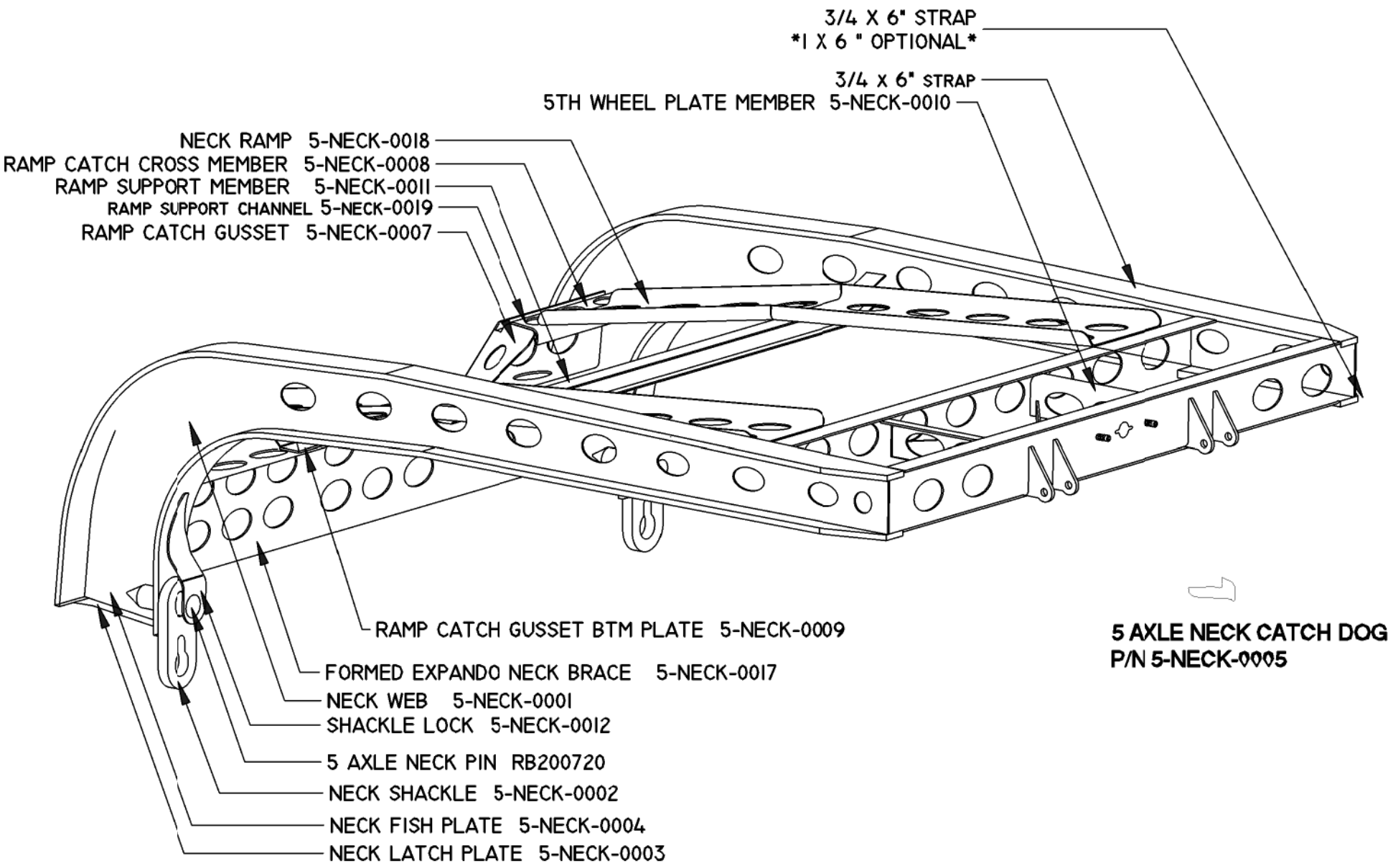

REAR FISH PLATE 5-REAR-0008
ISLAND CLEAT 5-REAR-0007
ISLAND PLATE 5-REAR-0006
OUTSIDE ROLL PLATE 5-REAR-0019
REAR WEB 5-REAR-0005
1 X 3"
T-1 STRAP
OUTSIDE ISL.PLATE 5-REAR-0012
INNNER ISL BOX 5-REAR-0012
OUTSIDE ISL.BOX
5-REAR-0011
INSIDE ISL.PLATE
5-REAR-0010
INSIDE ISL ROLL
5-REAR-0018
REAR ISL. CAP 5-REAR-0014
REAR ISL ROLL PLATE 5-REAR-0015

5 AXLE BEAVER TAIL PARTS LIST

PART NUMBER:	PART DESCRIPTION:	QTY:	MATERIAL:
5-REAR-0001	CATCH BLOCK SMALL	2	1" T-1
5-REAR-0002	CATCH BLOCK LARGE	2	1" T-1
5-REAR-0003	CATCH BLOCH---SMALL	2	1" T-1
5-REAR-0004	CATCH BLOCK----LARGE	2	1" T-1
5-REAR-0005	REAR WEB	2	1/4" T-1
5-REAR-0006	ISLAND PLATE	2	1/4" T-1
5-REAR-0007	ISLAND CLEAT	6	3/8" T-1
5-REAR-0008	REAR FISH PLATE	2	3/8" T-1
5-REAR-0009	INSIDE ISLAND PLATE	2	3/16" T-1
5-REAR-0010	OUTSIDE ISLAND BOX	4	3/16" T-1
5-REAR-0011	REAR INNER ISLAND BOX	4	3/16" T-1
5-REAR-0012	REAR OUTER BOX	4	3/16" T-1
5-REAR-0013	OUTSIDE ISLANDS PLATE	2	3/16" T-1
5-REAR-0014	REAR ISLAND CAP PLATE	2	3/16" T-1
5-REAR-0015	REAR ISLAND ROLL PLATE	2	3/16" T-1
5-REAR-0016	REAR INNER BOX	4	1/4" T-1
5-REAR-0017	REAR OUTER BOX	4	1/4" T-1
5-REAR-0018	INSIDE ISLAND ROLL BEND RIGHT / LEFT	2	3/16" T-1
5-REAR-0019	OUTSIDE ROLL PLATE	2	3/16" T-1
5-REAR-0020	TAIL LIGHT PLATE BEND FOR RIGHT/LEFT	2	3/16 T-1

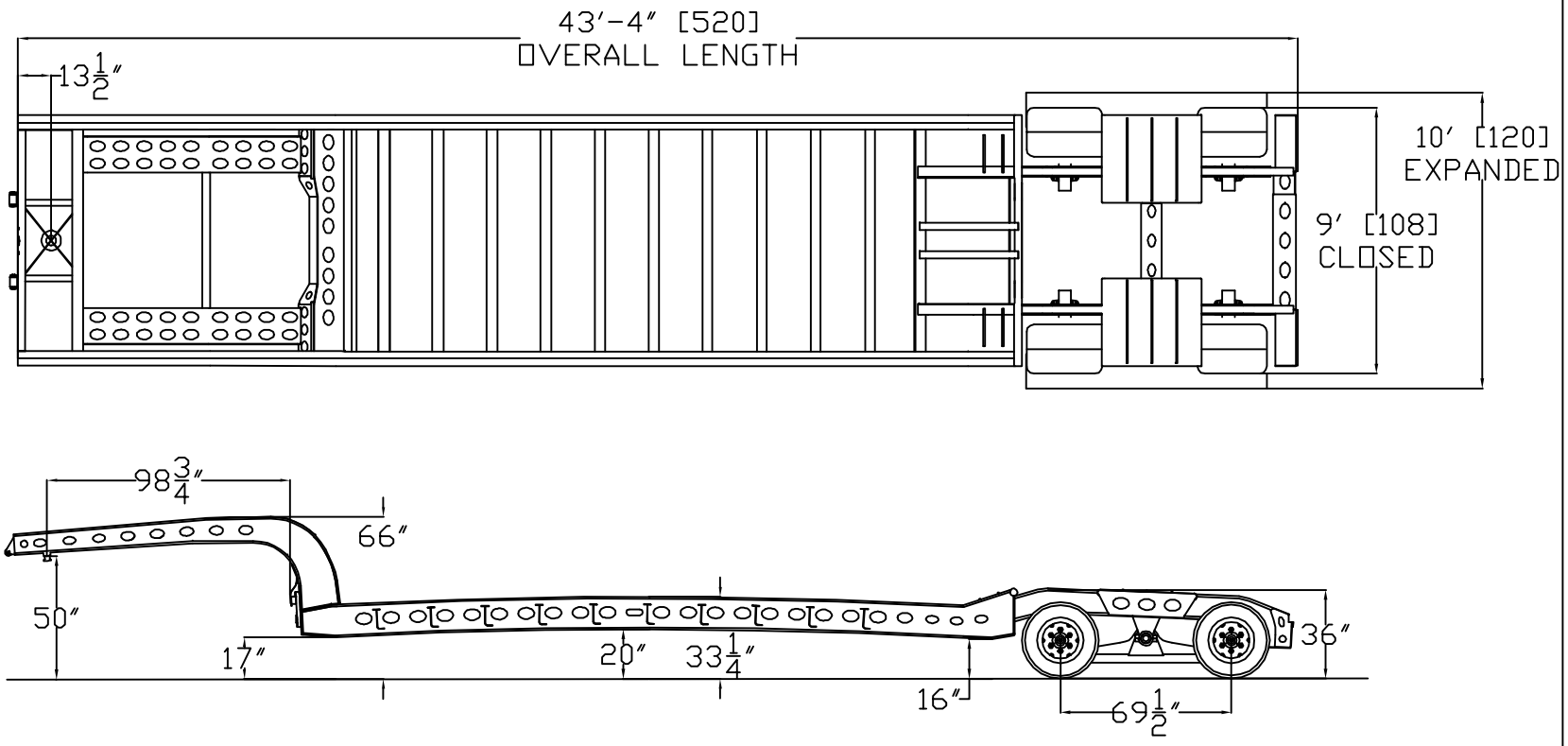


GROUP:	PART NUMBER:	PART DESCRIPTION:	QTY:	MATERIAL:
	NECK			
FRONT NECK:	5-NECK-0001	NECK WEB	2	1/4" T-1
	5-NECK-0002	NECK SHACKLE	2	1-1/2" T-1
	5-NECK-0003	NECK LATCH PLATE	2	3/8' T-1
	5-NECK-0004	NECK FISH PLATE	2	3/8" T-1
	5-NECK-0005	NECK CATCH DOG	2	1" T-1
	5-NECK-0006	ROLLER BRACKET	4	1/2" T-1
	5-NECK-0007	RAMP CATCH GUSSET	2	1/4" T-1
	5-NECK-0008	RAMP CATCH CROSS MEMBER	2	1/4" T-1
	5-NECK-0009	RAMP CATCH GUSSET BOTTOM PLATE	1	1/4" T-1
	5/3-NECK-0010	5TH WHEEL PLATE CROSS MEMBER	1LFT/1RIGHT	1/4" T-1
	5-NECK-0011	RAMP SUPPORT CROSS MEMBER	1	3/16' T-1
	5-NECK-0012	SHACKLE LOCK	2	1/4" T-1
	5-NECK-0013			
	5-NECK-0014	5TH WHEEL PLATE STRAP	1	3/8" X 89-3/4" T-1
	5-NECK-0015	26" 5TH WHEEL PLATE	1	1/4" T-1
	5-NECK-0016	40" OPTIONAL 5TH WHEEL PLATE	1 OPT..	1/4" T-1
	5-NECK-0017	FORMED EXSPANDO NECK BRACE	1	1/4" T-1
	5 / 3-NECK-0018	NECK RAMP (SHARED WITH 3 AXLE)	2	1/4" T-1
	5-NECK-0019	RAMP SUPPORT CHANNEL	2	1/4" T-1
	RB200720	5 AXLE NECK PIN	2	3" T-1


3/4 X 6" STRAP
1 X 6 " OPTIONAL
3/4 X 6" STRAP
5TH WHEEL PLATE MEMBER 5-NECK-0010
NECK RAMP 5-NECK-0018
RAMP CATCH CROSS MEMBER 5-NECK-0008
RAMP SUPPORT MEMBER 5-NECK-0011
RAMP SUPPORT CHANNEL 5-NECK-0019
RAMP CATCH GUSSET 5-NECK-0007
RAMP CATCH GUSSET BTM PLATE 5-NECK-0009
FORMED EXPANDO NECK BRACE 5-NECK-0017
NECK WEB 5-NECK-0001
SHACKLE LOCK 5-NECK-0012
5 AXLE NECK PIN RB200720
NECK SHACKLE 5-NECK-0002
NECK FISH PLATE 5-NECK-0004
NECK LATCH PLATE 5-NECK-0003

5 AXLE NECK CATCH DOG
P/N 5-NECK-0005

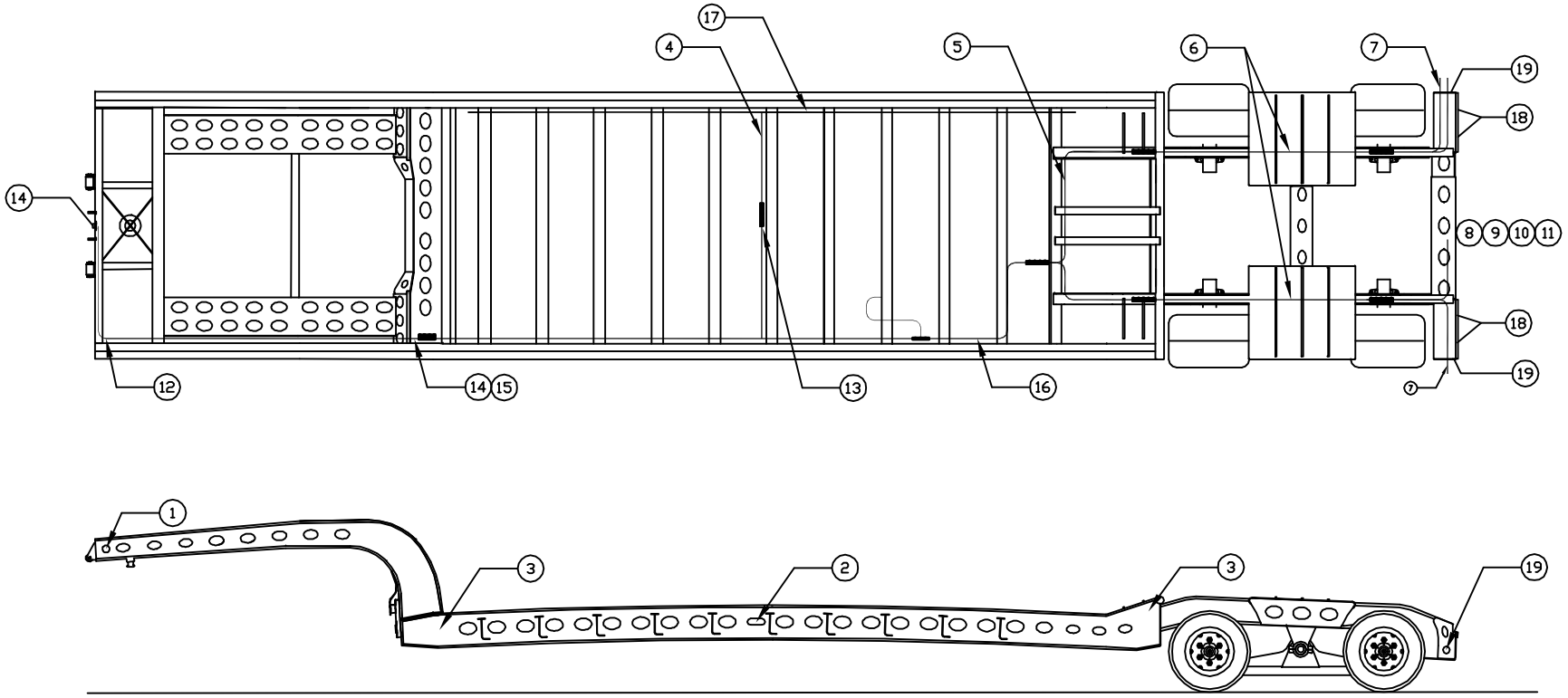
TRAILER TYPE: 5 AXLE EXPANDO



Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5 AXLE DIMENSIONS	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO



Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5 AXLE ELECTRICAL	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO

ELECTRICAL PARTS LIST

REF NUMBER	DESC.	MANUFACTURER	PART NUMBER	QUANITY
1	CLEARANCE MARKER LIGHT/ MTN RUBBER	GROTE	G1003 /9140	4 EACH
2	OVAL PARK/MIDTURN LAMP/ MOUNTING RUBBER	GROTE	G6003 / 9242	2 EACH
3	OVERSIZE LOAD PLUG	VARIES	NONE	4 EACH
4	PARALLEL WIRE	PHILLIPS	2/1/1900	AS NEEDED
5	REAR "T"	PHILLIPS	36-9400-5050	1 EACH
6	CUSTOM HARNESS EXTENSION	PHILLIPS	60-5019-05	2 EACH
7	REAR LAMP "T' PIG TAIL	PHILLIPS	36-9501	2 EACH
8	LICENSE PLATE LIGHT	GROTE	60101	1
9	OPTIONAL TAIL /MARKER LIGHT	GROTE	3002 / 92120	2 EACH
10	REAR "T" LICENSE ,ID MARKER HARNESS	PHILLIPS	36-9601	1 EACH
11	I.D. MARKER LIGHT (I.E.C.)	TRUCK LIGHT	60101	1 EACH
12	7 WAY WIRE	PHILLIPS	3-326	AS NEEDED
13	MID TURN HARNESS	PHILLIPS	36-9000-360	1 EACH
14	7 WAY SOCKET / SOCKET BOOT	PHILLIPS	16-722/15-740	2 EACH
15	MALE 7 WAY PLUG	PHILLIPS	15-730	1 EACH
16	HARNESS	PHILLIPS	10-7319-00	1 EACH
17				
18	STOP-TAIL-TURN LLIGHT /MT RUBBER	GROTE	G4002/9174	4 EACH
19				
20	OPTIONAL MARKER LIGHT ...MILLENIUM	PANEL LITE	212235	AS NEEDED
21				
22				

Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5 AXLE ELECTRICAL	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO

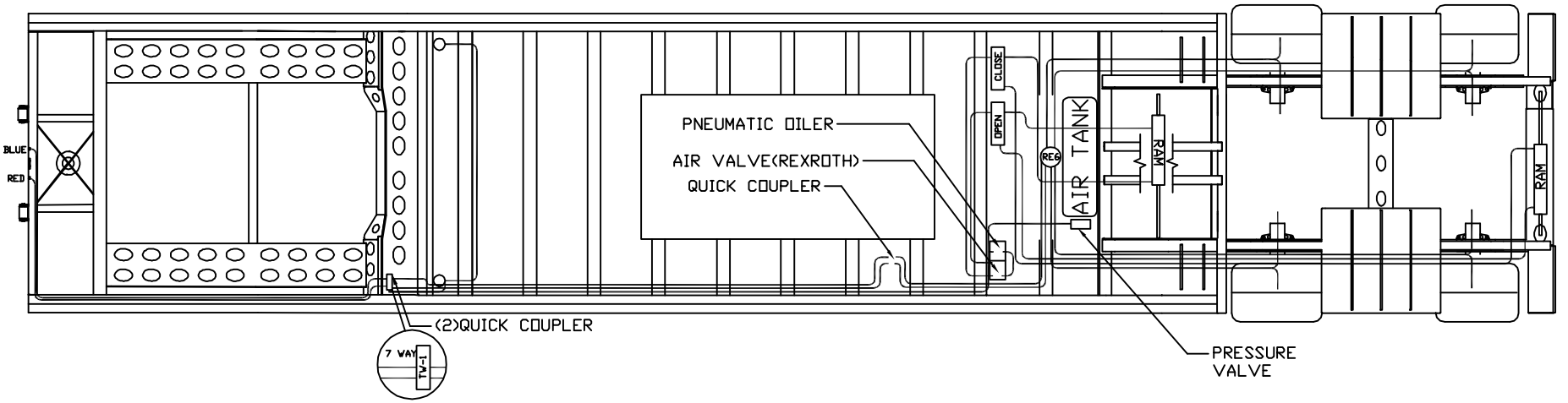
ELECTRICAL PARTS LIST

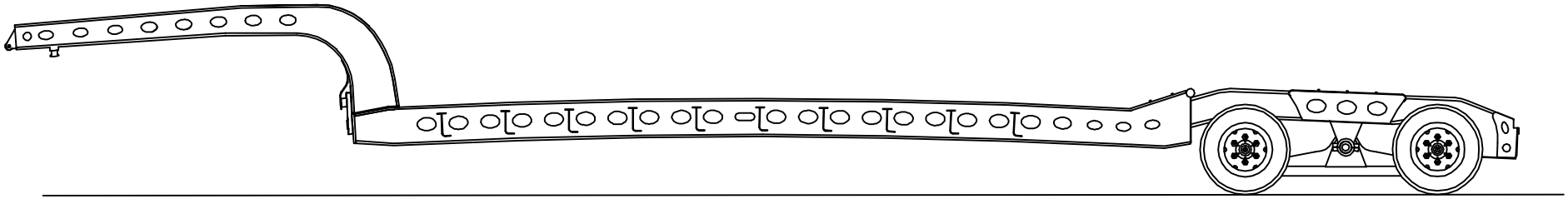
REF NUMBER	DESC.	MANUFACTURER	PART NUMBER	QUANITY
1	CLEARANCE MARKER LIGHT/ MTN RUBBER-(AMBER)	GROTE	G1003 /9140	2 EACH
2	OVAL PARK/MIDTURN LAMP/ MOUNTING RUBBER	GROTE	G6003 / 9242	2 EACH
3	OVERSIZE LOAD PLUG	VARIES	NONE	4 EACH
4	PARALLEL WIRE	PHILLIPS	2-403	AS NEEDED
5	REAR "T"	PHILLIPS	36-9400-5050	1 EACH
6	CUSTOM HARNESS EXTENSION	PHILLIPS	60-5019-05	2 EACH
7	REAR LAMP "T' PIG TAIL	PHILLIPS	36-9501	2 EACH
8	LICENSE PLATE LIGHT	GROTE	60101	1
9	OPTIONAL TAIL /MARKER LIGHT	GROTE	3002 / 92120	2 EACH
10	REAR "T" LICENSE ,ID MARKER HARNESS	PHILLIPS	36-9601	1 EACH
11	I.D. MARKER LIGHT (I.E.C.)	TRUCK LIGHT	60101	1 EACH
12	7 WAY WIRE	PHILLIPS	3-326	AS NEEDED
13	MID TURN HARNESS	PHILLIPS	36-9000-360	1 EACH
14	7 WAY SOCKET / SOCKET BOOT	PHILLIPS	16-722/15-740	2 EACH
15	MALE 7 WAY PLUG	PHILLIPS	15-730	1 EACH
16	HARNESS	PHILLIPS	10-7319-00	1 EACH
17				
18	STOP-TAIL-TURN LLIGHT /MT RUBBER	GROTE	G4002/9174	4 EACH
19	CLEARANCE MARKER LIGHT /MTN RUBBER -(RED)	GROTE	G1004/9140	2 EACH
20	OPTIONAL MARKER LIGHT ...MILLENIUM	PANEL LITE	212235	AS NEEDED
21				
22				

Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5 AXLE ELECTRICAL	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO

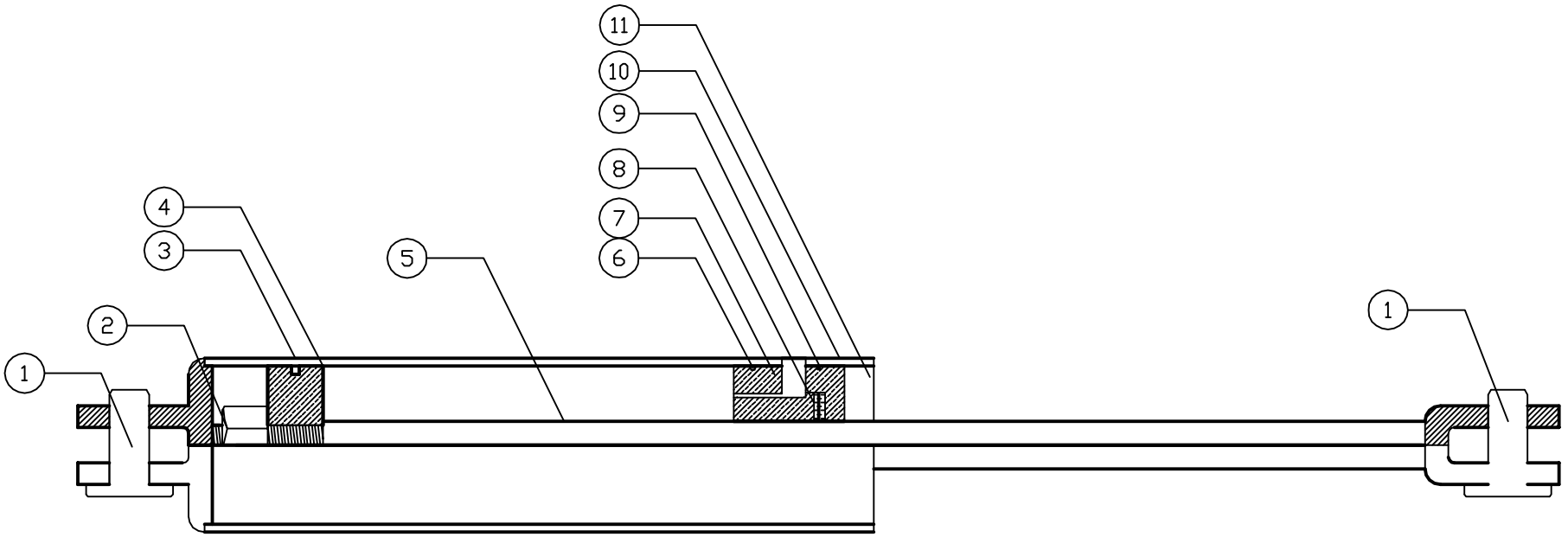




Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5 AXLE PNEUMATIC	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO



Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5" REAR CYL.	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

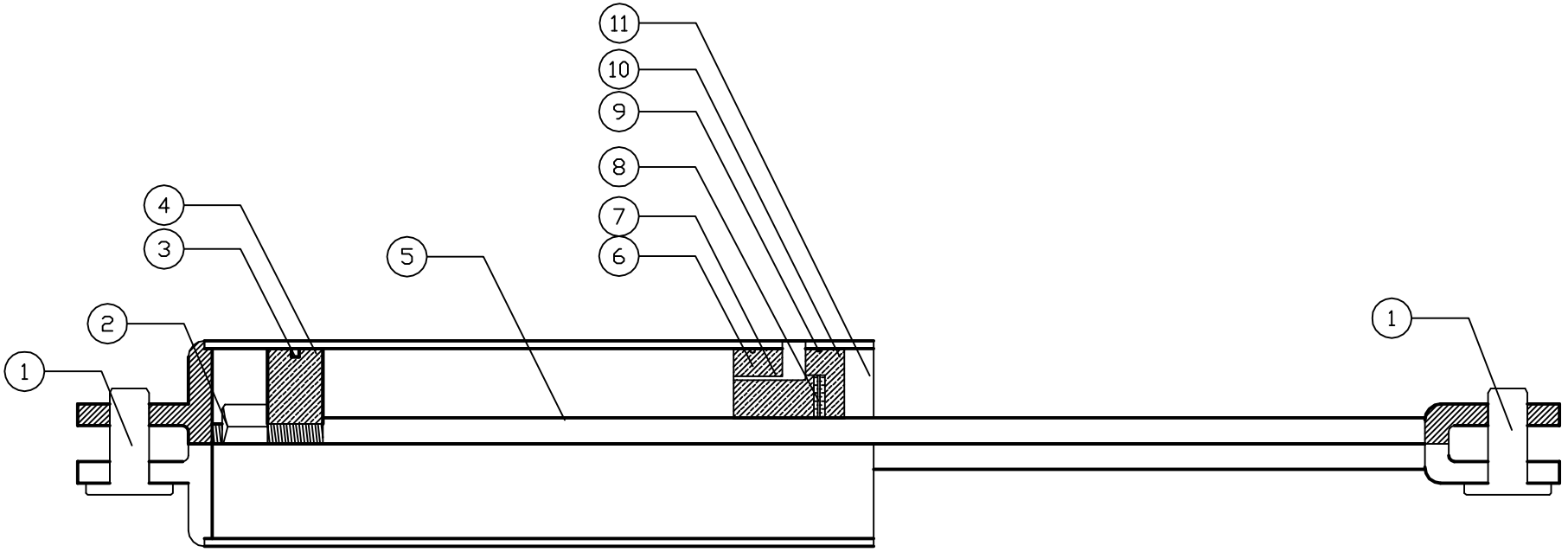
TRAILER TYPE: 5 AXLE EXPANDO

5" BORE CYLINDER PARTS				
REF NUMBER	DESC.	MANUFACTURER	PART NUMBER	QUANITY
1	RETAINING PIN	RACKLEY	5-100-100	2
2	PISTON RETAINER NUT	RACKLEY	5-100-101	1
3	PISTON SEAL	RACKLRY	5-500-102	1
4	PISTON	RACKLEY	5-500-103	1
5	MAIN SHAFT	RACKLEY	5-500-104	1
6	GLAND O RING	RACKLEY	5-500-105	1
7	GLAND	RACKLEY	5-500-106	1
8	GLAND SEAL	RACKLEY	5-500-107	1
9	GLAND O RING	RACKLEY	5-500-108	1
10	OUTER TUBE	RACKLEY	5-500-109	1
11	END CAP	RACKLEY	1-500-110	1
12				
13				
14				
15				

Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 5" REAR CYL.	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO



Rackley
BILT CUSTOM TRAILERS

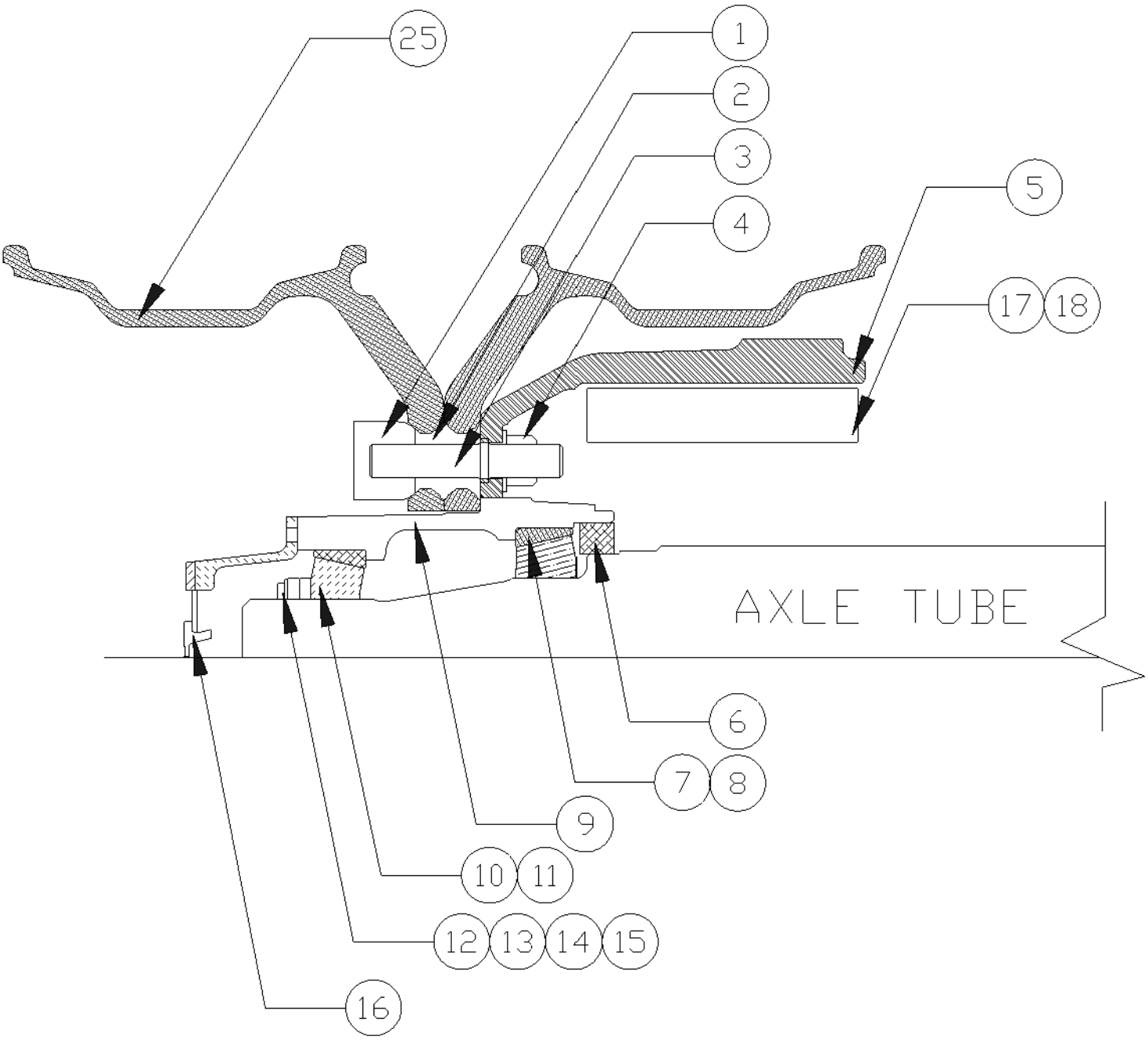
DATE:9/2/2009	DWG NAME 6" FRONT CYL.	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE

TRAILER TYPE: 5 AXLE EXPANDO

6" BORE CYLINDER PARTS				
REF NUMBER	DESC.	MANUFACTURER	PART NUMBER	QUANITY
1	RETAINING PIN	NONE	5-100-100	2
2	PISTON RETAINER NUT	NONE	5-100-101	1
3	PISTON SEAL	NONE	5-600-102	1
4	PISTON	RACKLEY	5-600-103	1
5	MAIN SHAFT	RACKLEY	5-600-104	1
6	LARGE GLAND O RING	NONE	5-600-105	1
7	GLAND	NONE	5-600-106	1
8	GLAND SEAL	NONE	5-600-107	1
9	SMALL GLAND O RING	NONE	5-600-108	1
10	OUTER TUBE	NONE	5-600-109	1
11	END CAP	RACKLEY	5-600-110	1
12				
13				
14				
15				

Rackley
BILT CUSTOM TRAILERS

DATE:9/2/2009	DWG NAME 6" FRONT CYL.	REV A
SCALE:NONE	SHEET: 1 OF 1	MATERIAL: NONE


25
1
2
3
4
5
17
18
AXLE TUBE
6
7
8
9
10
11
12
13
14
15
16

BRAKE PART LIST -PER WHEEL END

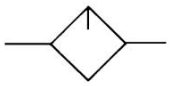
REF NUMBER	DESC.	MANUFACTURER	PART NUMBER	QUANITY
1	OUTER LUG NUT/RIGHT	LELAND	W13P	6 EACH
0	OUTER LUG NUT/LEFT	LELAND	W14P	6 EACH
2	INNER NUT/RIGHT	LELAND	W486	6 EACH
0	INNER NUT/LEFT	LELAND	W487	6 EACH
3	SHOULDER STUD/RIGHT	LELAND	W42	6 EACH
0	SHOULDER STUD LEFT	LELAND	W43	6 EACH
	CRIMPED BACKING NUT	LELAND	W451	6 EACH
0				
5	BRAKE DRUM	WEBB	63654F	1 EACH
6	OIL SEAL	STEMCO	373-0243	1 EACH
7	INSIDE CUP/LARGE	TIMKEN	HM218210	1 EACH
8	INSIDE CONE/LARGE	TIMKEN	HM218248	1 EACH
9	HUB	WEBB	1056	1 EACH
10	OUTSIDE CUP	TIMKEN	HM212011	1 EACH
11	OUSIDE CONE	TIMKEN	HM212049	1 EACH
12	OUTER NUT	LELAND	L178	1 EACH
13	OUTER LOCK WASHER	LELAND	L1327	1 EACH
14	INSIDE NUT	LELAND	L176	1 EACH
15	INSIDE LOCK WASHER	LELAND	L177	1 EACH
16	HUB CAP	STEMCO	340-4009	1 EACH
17	BRAKE SHOE	LELAND	L2917	1 PAIR
18	BRAKE KIT/W SPRINGS	LELAND	K501	1 KIT
19				
20	S CAM/RIGHT	BENDIX	M12WKR15-074	1 EACH
21	S CAM /LEFT	BENDIX	M12WKL15-074	1 EACH
22	SLACK ADJUSTER	HALDEX	40910216	1 EACH
23	ROTO CHAMBER TYPE 16	BENDIX	229816N	1 EACH
24	CLEVIS KIT W/ PIN	BUYERS	B27086ANFZKT	1 EACH
25	ALUMINUM WHEEL/SATIN POLISHED 6 LUG	ALCOA	663170	1 EACH
26	ALUMINUM/POLISHED 6 LUG	ALCOA	663172	1 EACH
27				

Lubricator
Series AL10 to 60

AL20

AL40

JIS Symbol



How to Order

AL **30** – **F** **03** **B** – **2R**

- Lubricator
- Body size: 10, 20, 30, 40, 50, 60
- Thread type

Nil	Metric thread (M5)
	Rc
N	NPT
F	G

- Port size

Symbol	Port size	Body size 10	20	30	40	50	60
M5	M5	●	—	—	—	—	—
01	1/8	—	●	—	—	—	—
02	1/4	—	●	●	●	—	—
03	3/8	—	—	●	●	—	—
04	1/2	—	—	—	—	—	—
06	3/4	—	—	—	—	●	—
10	1	—	—	—	—	●	●

- Option

Symbol	Description	Applicable model
1	1000 cm³ tank	AL30 to 60
10	1000 cm³ tank with level switch (Lowest limit ON)	AL30 to 60
11	1000 cm³ tank with level switch (Lowest limit OFF)	AL30 to 60
2	Metal bowl	AL10 to 60
3	With drain cock	AL10 to 60
6	Nylon bowl (Including sight dome)	AL10 to 60
8	Metal bowl with level gauge	AL30 to 60
C	With bowl guard	AL20
R	Flow direction: Right → Left	AL10 to 60
3W	Drain cock with barb fitting: ø6 x ø4 nylon tubing	AL30 to 60
Z (2)	Name plate and caution plate for bowl in imperial units (PSI, °F)	AL10 to 60

- Accessory ∗ When more than one specification is required, indicate in alphanumeric order.

Symbol	Description	Applicable model
Nil	—	—
B (1)	With bracket	AL20 to AL 60

Note 1) Bracket is not assembled and is supplied loose at the time of shipment.

Note 2) For M5 and NPT thread types. This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.)

◎: Combination available ○: Varies depending on the model ▭: Combination not available △: Available only with NPT thread

Accessory/Optional Specifications Combinations

Accessory/Optional specifications \ Combination		Symbol	Accessory B	Optional specifications 1	10	11	2	3	6	8	C	R	3W	Z	Applicable lubricator AL10	AL20	AL30 to 60
Accessory	With bracket	B		○	○	○	◎	◎	◎	○	○	◎	○	△		◎	◎
Optional specifications	1000 cm³ tank	-1	◎									◎		△			◎
	1000 cm³ tank with level switch (Lowest limit ON)	-10	◎									◎		△			◎
	1000 cm³ tank with level switch (Lowest limit OFF)	-11	◎									◎		△			◎
	Metal bowl	-2	◎					◎				◎		△	◎	◎	◎
	With drain cock	-3	◎				◎		◎	○	○	◎	○	△	◎	◎	◎
	Nylon bowl (Including sight dome)	-6	◎					◎			○	◎	○	△	◎	◎	◎
	Metal bowl with level gauge	-8	◎					◎				◎		△			◎
	With bowl guard	-C	◎					◎	◎			◎		△		◎	
	Flow direction: Right → Left	-R	◎	◎	◎	◎	◎	◎	◎	◎	◎		◎	△	◎	◎	◎
	Drain cock with barb fitting: ø6 x ø4 nylon tubing	-3W	◎					◎	◎			◎		△			◎
	Name plate and caution plate for bowl in imperial units (PSI, °F)	-Z	△	△	△	△	△	△	△	△	△	△	△		△	△	△

Note) -1, -10, -11 are for a metal bowl with level gauge that comes with drain cock.

Standard Specifications

Model	AL10	AL20	AL30	AL40	AL40-06	AL50	AL60
Port size	M5 x 0.8	1/8, 1/4	1/4, 3/8	1/4, 3/8, 1/2	3/4	3/4, 1	1
Fluid	Air						
Proof pressure	1.5 MPa						
Maximum operating pressure	1.0 MPa						
Minimum dripping flow rate (ℓ/min (ANR)) Note)	4	15	1/4: 30 3/8: 40	1/4: 30 3/8: 40 1/2: 50	50	190	220
Oil capacity (cm³)	7	25	55	135	135	135	135
Recommended lubricant	Class 1 turbine oil (ISO VG32)						
Ambient and fluid temperature	–5 to 60°C (With no freezing)						
Bowl material	Polycarbonate						
Bowl guard	—	Option	Standard				
Weight (kg)	0.07	0.20	0.24	0.47	0.52	1.06	1.13

Note 1) • The flow rate is 5 drips/min under the following conditions: Inlet pressure of 0.5 MPa; Class 1 turbine oil (ISO VG32); Temperature at 20°C; Oil adjustment valve fully open.
• Use air consumption flow rate for minimum dripping flow rate.

Accessory Part No.

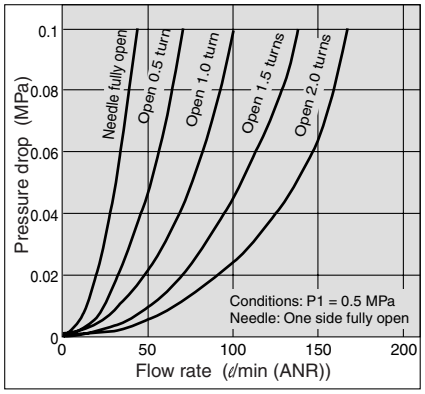
Accessory \ Applicable model	AL10	AL20	AL30	AL40	AL40-06	AL50	AL60
Bracket assembly Note)	—	AF20P-050AS	AF30P-050AS	AF40P-050AS	AF40P-070AS	AF50P-050AS	AF50P-050AS

∗ The part number for bracket assembly for 1000 cm³ is AF50P-050AS (applicable to AL30 to AL60).
Note) Assembly includes a bracket and 2 mounting screws.

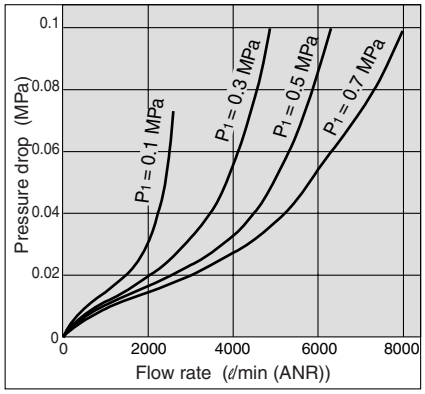
Flow Characteristics (Representative values)

Condition: Inlet pressure 0.7 MPa

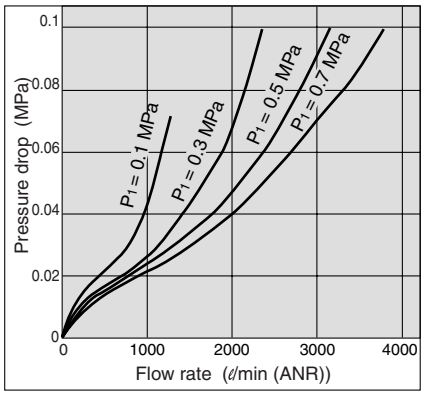
AL10 M 5



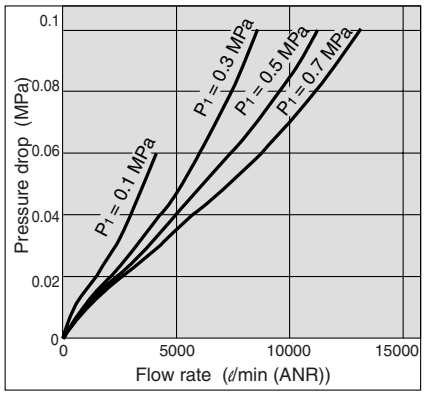
AL40-06 Rc 3/4



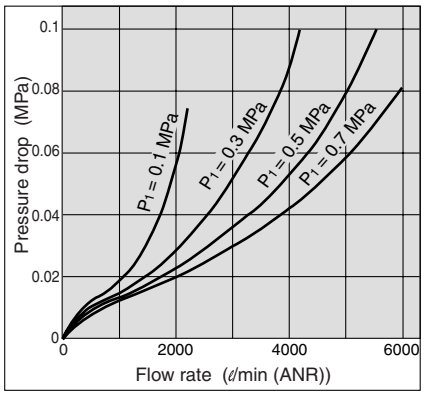
AL20 Rc 1/4



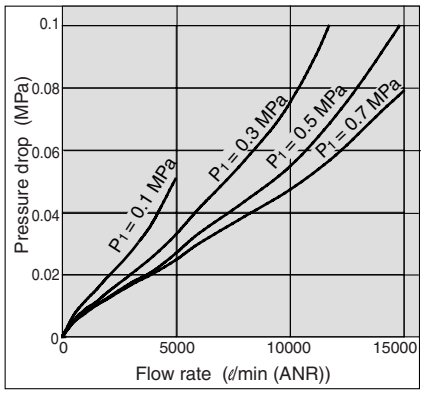
AL50 Rc 1



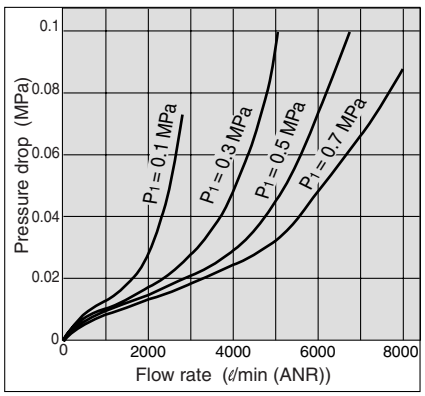
AL30 Rc 3/8



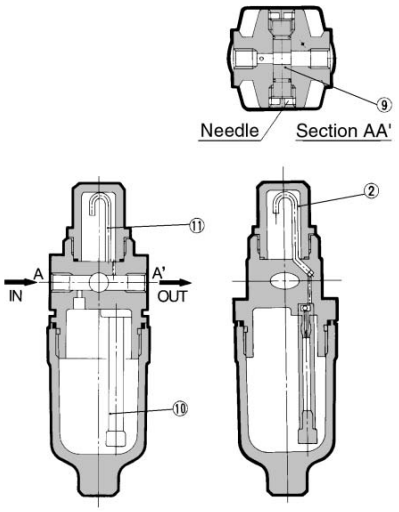
AL60 Rc 1



AL40 Rc 1/2



Working Principle: Type AL10



A portion of the air introduced from the IN side pressurizes the lubricant inside the bowl. The remainder of the air passes through the needles ⑨, and flows to the OUT side. The pressure differential between the inside of the bowl and the inside of the sight dome ②, causes the lubricant inside the bowl into the oil passage ⑩. The lubricant drips from the dripping tube ⑪, and lubricate the OUT side. The amount of lubricant is adjusted by the needle ⑨, on the front face. Turning the needle clockwise increases the amount of the lubricant, and turning it counterclockwise until fully opened shuts off the lubricant. The needle on the side that is not used should be left fully opened.

Note) The operating principle for AL20 to 60 types is different from that of AL10

⚠ Precautions

Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

Selection

⚠ Warning

1. Do not introduce air from the outlet side as this can damage the damper.

⚠ Caution

1. Use a check valve (Series AKM) to prevent back flow of the lubricant when redirecting the air flow before the lubricator.

Maintenance

⚠ Warning

1. For AL 10 and AC20 type, replenish the lubricant after releasing the inlet pressure. Lubrication cannot take place under a pressurized condition.

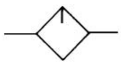
⚠ Caution

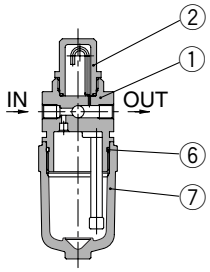
1. Check the dripping amount once a day. Drip failure can cause damage to the components that need lubrication.

Construction

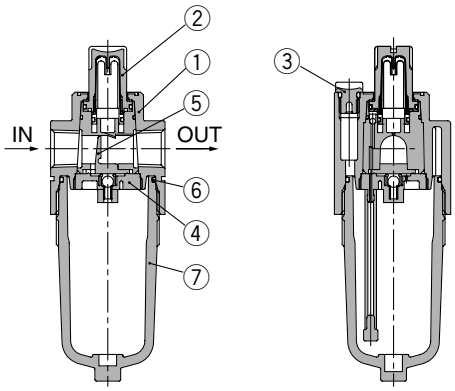
AL10

JIS Symbol

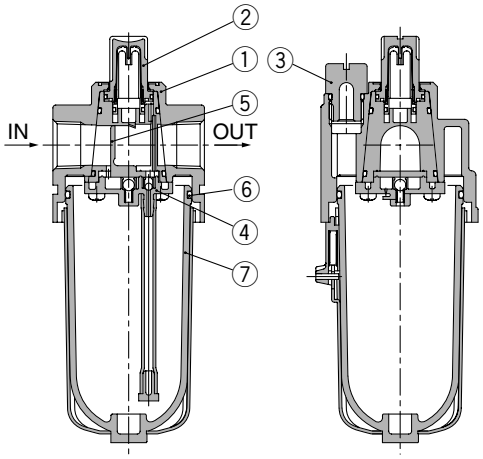




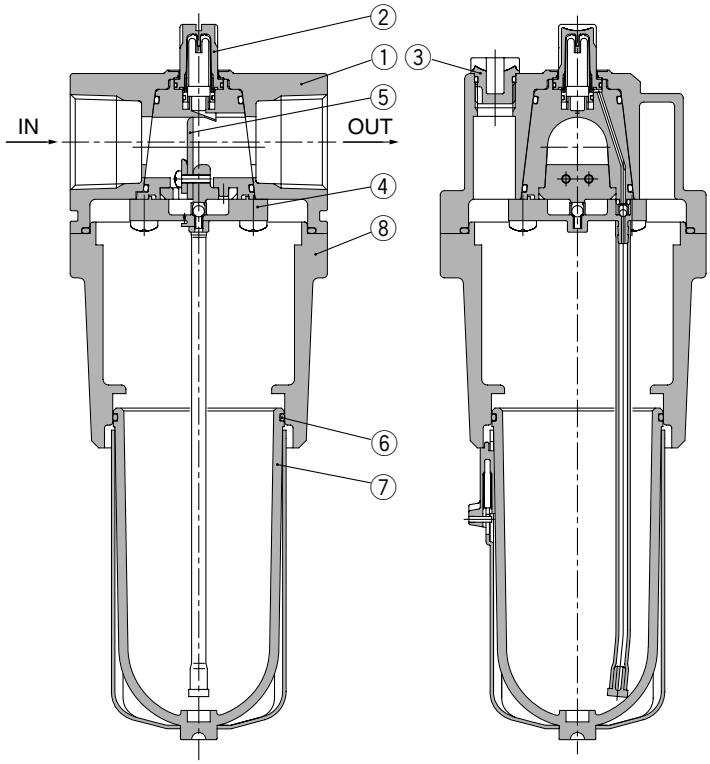
AL20



AL30/40



AL50/60



Component Parts

No.	Description	Material			Note
		AL10/20	**AL30/40/40-06**	**AL50/60**	
①	Body	Zinc die-casted	Aluminum die-casted		Platinum silver
⑧	Housing	—		Aluminum die-casted	Platinum silver

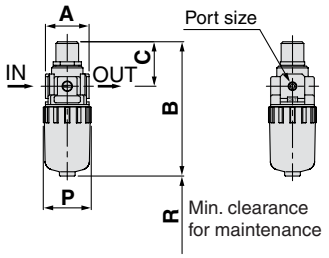
Replacement Parts

No.	Description	Material	Part no.						
			AL10	**AL20**	**AL30**	**AL40**	**AL40-06**	**AL50**	**AL60**
②	Sight dome assembly	PC	AL10P-080AS	AL20P-080AS	AL20P-080AS	AL20P-080AS	AL20P-080AS	AL20P-080AS	AL20P-080AS
③	Lubrication plug assembly	—	—	AL20P-060AS	AL30P-060AS	AL40P-060AS	AL40P-060AS	AL40P-060AS	AL40P-060AS
④	Damper retainer assembly (1)	—	—	AL20P-030AS	AL30P-030AS	AL40P-030AS	AL40P-030AS	AL50P-030AS	AL60P-030AS
⑤	Damper assembly	Synthetic resin	—	AL20P-040S	AL30P-040S	AL40P-040S	AL40P-040S	AL50P-040AS	AL60P-040AS
⑥	Bowl O-ring	NBR	C1SFP-260S	C2SFP-260S	C3SFP-260S	C4SFP-260S	C4SFP-260S	C4SFP-260S	C4SFP-260S
⑦	Bowl assembly (2)	PC	C1SL	C2SL	C3SL (3)	C4SL (3)	C4SL (3)	C4SL (3)	C4SL (3)

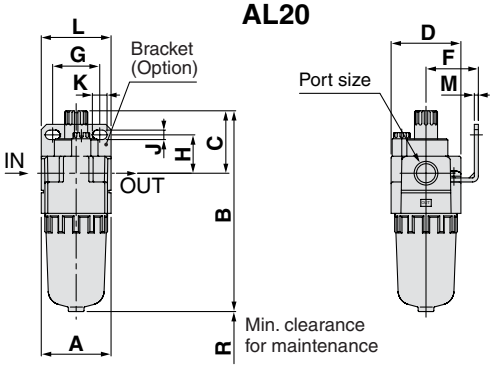
Note 1) Add "-1" at the end of the part number when ordering a damper retainer assembly for 1000 cm^3.
Example) AL30P-030AS-1
Note 2) Including O-ring. Please contact SMC regarding the bowl assembly supply for PSI and °F unit specifications.
Note 3) Bowl assembly for AL30 to AL60 comes with a bowl guard (steel band material).

Dimensions

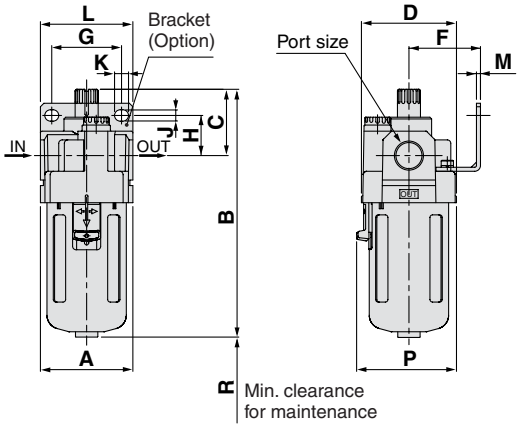
AL10



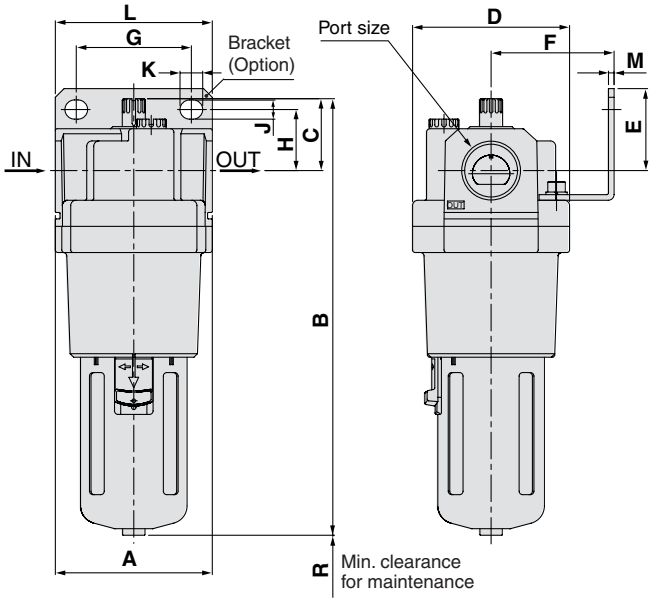
AL20

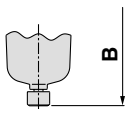
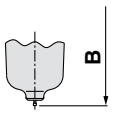
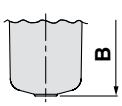
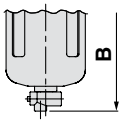
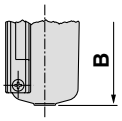
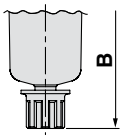
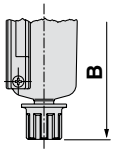
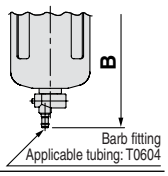


AL30/40



AL50/60



Applicable model	AL10, AL20		AL30, AL40, AL40-06, AL50, AL60					
	With drain cock	Metal bowl with drain cock	Metal bowl	With drain cock	Metal bowl with level gauge	Metal bowl with drain cock	Metal bowl with drain cock & level gauge	Drain cock with barb fitting
Optional specifications								

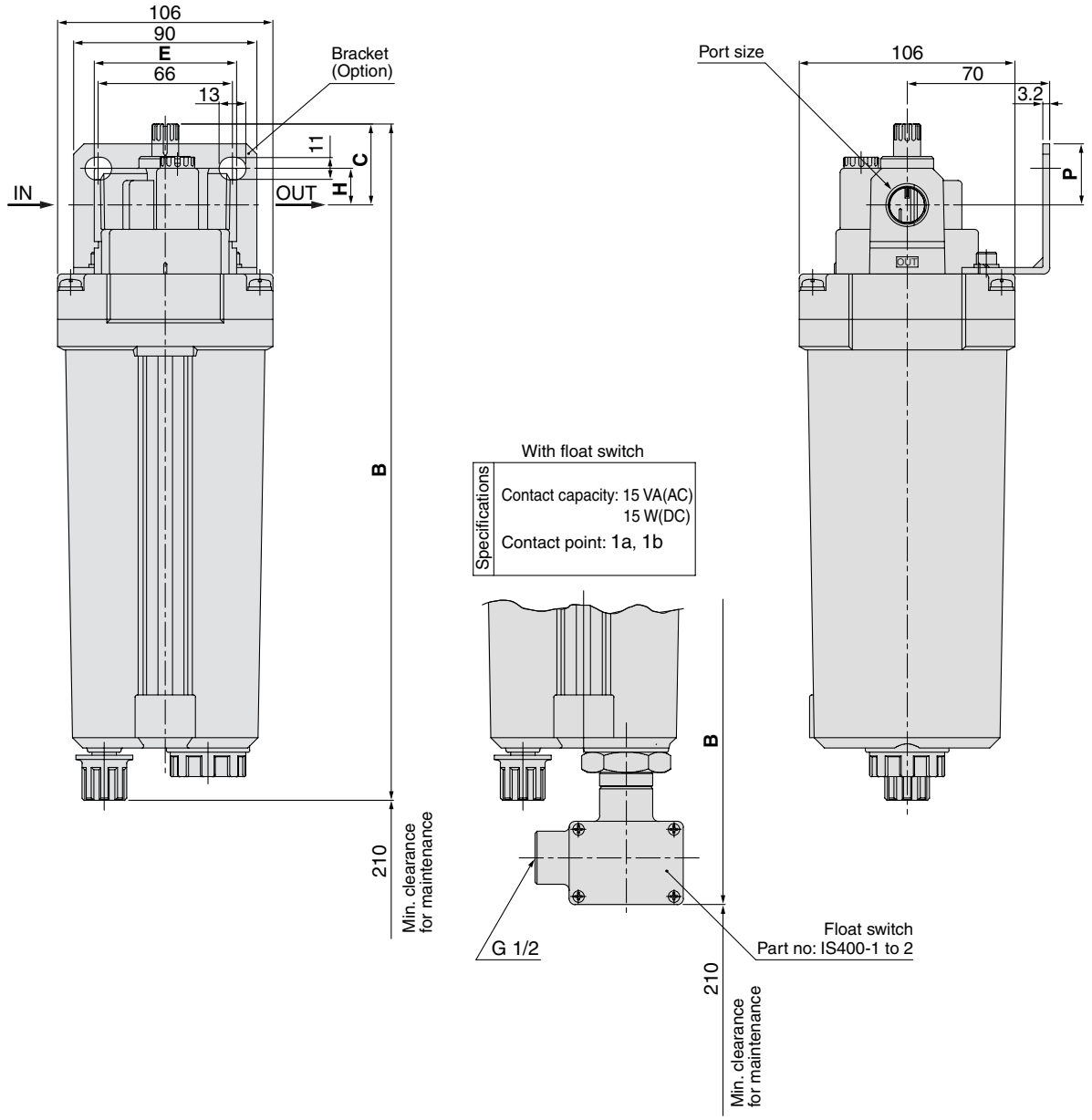
(mm)

Model	Port size	Standard specifications						Accessory specifications							
								Bracket mounting size							
		A	B	C	D	P	R	E	F	G	H	J	K	L	M
AL10	M5 x 0.8	25	77	26	25	28	35	—	—	—	—	—	—	—	—
AL20	1/8, 1/4	40	115	36	40	—	60	—	30	27	22	5.4	8.4	40	2.3
AL30	1/4, 3/8	53	142	38	53	57	80	—	41	40	23	6.5	8	53	2.3
AL40	1/4, 3/8, 1/2	70	176	40	70	73	110	—	50	54	26	8.5	10.5	70	2.3
AL40-06	3/4	75	176	38	70	73	110	—	50	54	25	8.5	10.5	70	2.3
AL50	3/4, 1	90	250	41	90	—	110	47	70	66	35	11	13	90	3.2
AL60	1	95	268	45	95	—	110	47	70	66	35	11	13	90	3.2

Model	Optional specifications					
	With drain cock	With barb fitting	Metal bowl	Metal bowl with drain cock	Metal bowl with level gauge	Metal bowl with drain cock & level gauge
	B	B	B	B	B	B
AL10	85	—	82	85	—	—
AL20	123	—	121	124	—	—
AL30	153	161	142	166	162	186
AL40	187	195	176	200	196	220
AL40-06	187	195	176	200	196	220
AL50	261	269	250	274	270	294
AL60	279	287	268	292	288	312

Dimensions

Option: 1000 cm³ tank



(mm)

Model	Port size	B	C	E	With bracket		With float switch
					H	P	B
AL30	1/4, 3/8	324	38	53	25	—	374
AL40	1/4, 3/8, 1/2	333	40	70	18	—	383
AL40-06	3/4	333	38	75	16	—	383
AL50	3/4, 1	332	41	90	35	47	382
AL60	1	335	45	95	35	47	385

Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of **"Caution", "Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ **Caution :** Operator error could result in injury or equipment damage.

⚠ **Warning :** Operator error could result in serious injury or loss of life.

⚠ **Danger :** In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power--General rules relating to systems.
Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driver objects have been confirmed.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Common Precautions

Be sure to read before handling.
For detailed precautions on every series, refer to main text.

Selection

⚠ Warning

1. Confirm the specifications.

Products represented in this catalog are designed for use in compressed air appllications only (including vacuum), unless otherwise indicated.
Do not use the product outside their design parameters.
Please contact SMC when using the products in applications other than compressed air (including vacuum).

Mounting

⚠ Warning

1. Instruction manual

Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

2. Securing the space for maintenance

When installing the products, please allow access for maintenance.

3. Tightening torque

When installing the products, please follow the listed torque specifications.

Piping

⚠ Caution

1. Before piping

Make sure that all debris, cutting oil, dust, etc, are removed from the piping.

2. Wrapping of pipe tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not get inside the piping. Also, when the pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.

Air Supply

⚠ Warning

1. Operating fluid

Please consult with SMC when using the product in applications other than compressed air (including vacuum).
Regarding products for general fluid, please ask SMC about applicable fluids.

2. Install an air dryer, aftercooler, etc.

Excessive condensate in a compressed air system may cause valves and other pneumatic equipment to malfunction.
Installation of an air dryer, after cooler etc. is recommended.

3. Drain flushing

If condensate in the drain bowl is not emptied on a regular basis, the bowl will over flow and allow the condensate to enter the compressed air lines.
If the drain bowl is difficult to check and remove, it is recommended that a drain bowl with the auto-drain option be installed.
For compressed air quality, refer to “Air Preparation Equipment” catalog.

4. Use clean air

If the compressed air supply is contaminated with chemicals, cynthetic materials, corrosive gas, etc., it may lead to break down or malfunction.

Operating Environment

⚠ Warning

1. Do not use in environments where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.

2. Do not expose the product to direct sunlight for an extended period of time.

3. Do not use in a place subject to heavy vibrations and/or shocks.

4. Do not mount the product in locations where it is exposed to radiant heat.

Maintenance

⚠ Warning

1. Maintenance procedures are outlined in the operation manual.

Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

2. Maintenance work

If handled improperly, compressed air can be dangerous.
Assembly, handling and repair of pneumatic systems should be performed by qualified personnel only.

3. Drain flushing

Remove drainage from air filters regularly. (Refer to the specifications.)

4. Shut-down before maintenance

Before attempting any kind of maintenance make sure the supply pressure is shut of and all residual air pressure is released from the system to be worked on.

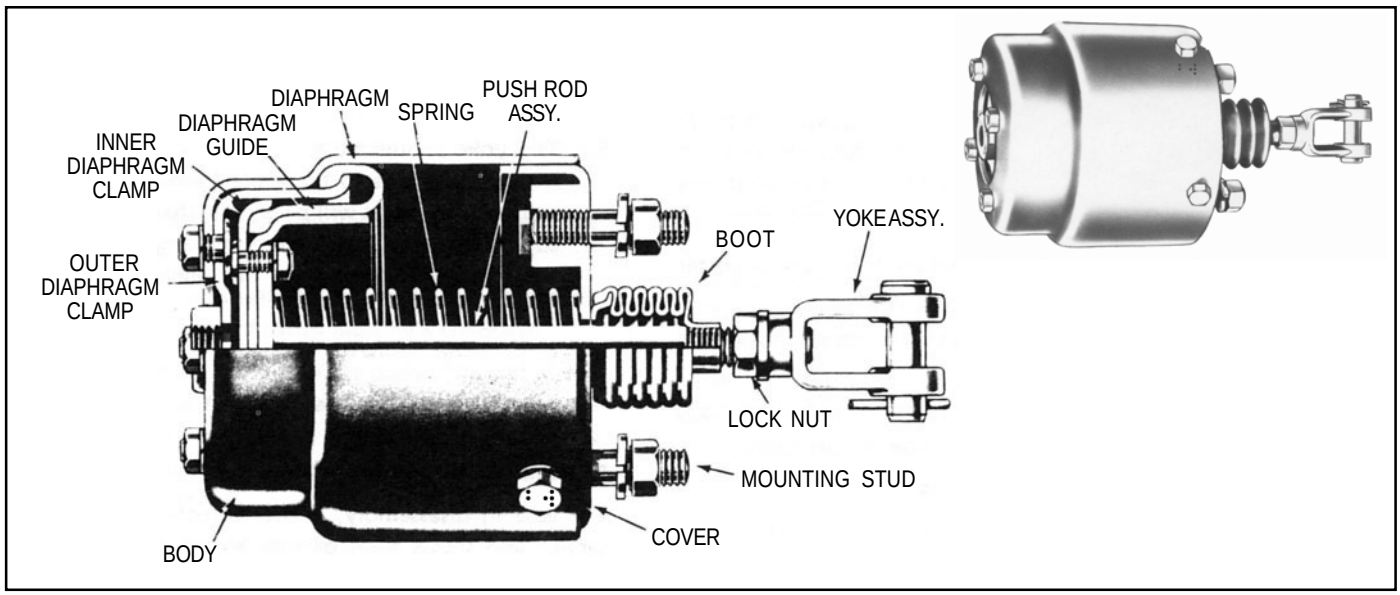
5. Start-up after maintenance and inspection

Apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please verify product set-up parameters.

6. Do not make any modifications to be product.

Do not take the product apart.

Rotochambers



DESCRIPTION

The rotochamber is an actuator which converts the energy of air pressure into mechanical force. The type number of the rotochamber indicates the actuator's diaphragm effective area (Type 30 - 30 sq. in. of diaphragm) and the various sizes available give a wide range of output force and length of stroke. The rolling type diaphragm provides long life and gives a constant output force throughout the entire stroke.

One end of the diaphragm is clamped to the inside wall of the body by the outer clamp. The other end of the diaphragm is clamped between the diaphragm guide and inner diaphragm clamp. The cover is fastened to the outer body by cap screws. Mounting studs are used to mount the chambers. A boot retained by a boot retainer is used to prevent entrance of moisture through the hole in the cover. A lock nut and yoke with pin are screwed on the threaded push rod. Most rotochambers now have 3/8 in. NPTF inlet ports. The long stroke Type 50 employ a 1/2 in. NPTF inlet port.

OPERATION

Controlled air pressure enters the rotochamber through the inlet port and acts upon the diaphragm, moving the diaphragm guide and diaphragm forward. The diaphragm moves along the inside wall of the cylinder body with a smooth rolling motion. The forward motion of the diaphragm guide and diaphragm forces the push plate and push rod forward.

When the rotochamber is used to actuate cam type foundation brake assemblies, the yoke is connected to a slack adjuster which in turn is connected to the brake cam shaft. This forward motion of the push rod rotates the slack adjuster, cam shaft and cam applying the vehicle brakes.

The rotochamber is also used in industrial applications and in such cases may be used in clamping or holding operations.

The greater air pressure admitted to the rotochamber, the greater the force applied by the push rod and, conversely, the less air pressure applied to the rotochamber, the less force applied by the push rod. Push rod force is determined by multiplying the air pressure delivered by the effective diaphragm area. For example, if 60 psi is admitted to the Type 30 rotochamber the lineal force on the end of the push rod is approximately 1800 lbs.

When air pressure is released from the rotochamber the rotochamber spring returns the slack adjuster (if applicable), push rod, diaphragm guide and diaphragm to the released position.

PREVENTIVE MAINTENANCE

A. Every month, 8,000 miles, or after 300 operating hours, depending on type of operation:
    1. Check push rod travel and adjust travel at the slack adjuster if needed. Push rod travel should be as short as possible without brakes dragging. Excessive push rod travel reduces braking efficiency, shortens diaphragm life, gives slow braking response and wastes air.
    2. Check push rod to slack adjuster alignment from release to full stroke position to be sure push rod moves out and returns properly without binding at the cover hole or with other structures. Also check the angle formed by the slack adjuster arm and push rod. It should be 90° or greater when the chamber is in the applied or released positions.
    3. Check tightness of mounting nuts. Check cotter pins to make sure they are in place.
    4. Check all hoses and lines. They should be secure and in good condition.
B. Every year or after each 100,000 miles or 3,600 operating hours, depending on type of operation.
    1. Disassemble and clean all parts.
    2. Install new diaphragm or any other parts if they are worn or deteriorated.

When the diaphragm, spring, or both are replaced they should be replaced in the corresponding chamber on the same axle.

OPERATING AND LEAKAGE TESTS

A. Operating Test
    1. Apply brakes and observe that the push rods move out promptly and without binding.
    2. Release brakes and observe that the push rods return to the released position promptly and without binding.
    3. Check push rod travel. Push rod travel should be as short as possible without brakes dragging. Adjust travel of push rod at slack adjuster if necessary.
B. Leakage Test
    1. Loosen rubber boot from around push rod hole in cover. Make and hold a full brake application.

Coat area with soap suds and check for leakage. No leakage is permissible. If leakage is detected, the diaphragm must be replaced.

REMOVING

1. Block vehicle wheels.
2. Disconnect line to rotochamber.
3. Remove the yoke pin.
4. Remove the rotochamber.

INSTALLING

1. Before installing chamber, check bracket for distortion, cracks or any condition which might cause chamber misalignment or malfunction.
2. Re-install the chamber on the bracket. Tighten the mounting nuts securely and evenly.
3. Connect the air lines to the rotochamber and check for leakage.
4. Insert the push rod yoke pin through the hole in the yoke and slack adjuster. Make sure the same hole location in the slack adjuster on each side of the axle is used.
5. The yoke should be adjusted on the push rod so that with brakes released the angle formed by the push rod and slack adjuster will be greater than 90° and all slack adjusters should be at the same angle. With properly adjusted brakes applied, the angle should still be greater than 90°.

DISASSEMBLY

For ease in disassembly, if the rotochamber has been in service and shows signs of rust accumulation, it is recommended that the chamber be immersed and soaked in the cleaning or rust dissolving solvent for 24 hours.

1. Remove yoke and lock nut from push rod.
2. Remove rubber boot.
3. Remove cap screws from cover.
4. Remove cover, springs and spring guides (if so equipped).
5. Remove nuts from body. These nuts secure the outer clamp to the body and are located at the air inlet end of the rotochamber.
6. Grasp the push rod and by pulling and wiggling the entire assembly consisting of push rod and plate, diaphragm guide, diaphragm, inner and outer clamps should ease out of the body.
7. Straighten the rolled diaphragm.
8. Remove outer diaphragm clamp.
9. Remove nuts from inside of diaphragm guide.
10. Disassemble inner diaphragm clamp, diaphragm and push plate rod assembly from the diaphragm guide.

CLEANING AND INSPECTION

1. Clean all metal parts in a good cleaning solvent.
2. Carefully inspect all metal parts for cracks, distortion or damage. Replace any parts not considered serviceable.
3. Replace diaphragm and rubber boot.

ASSEMBLY

1. Position the diaphragm on end in the inner diaphragm clamp. The smaller diameter end of the diaphragm should be against the diaphragm clamp.
2. Place and install the diaphragm guide within the diaphragm and over the inner diaphragm clamp studs.
3. Install the push plate push rod assembly within the diaphragm guide and over the inner diaphragm clamp studs.
4. Install nuts on the inner diaphragm clamp studs and tighten securely.
5. Place the assembly consisting of the push rod, push plate, diaphragm guide, diaphragm and inner clamp inside of the outer clamp.
6. Roll the free end of the diaphragm back and over the end of the outer diaphragm clamp.
7. Lubricate the inside wall of the body and the rolled surface of the diaphragm with Murphy's oil soap.
8. Slide the above assembly into the body. The end of the diaphragm should fit snugly against the shoulder in the body. Position the outer diaphragm clamp studs through the holes at the end of the body, install nuts and tighten securely.
9. Install spring guide (if so equipped) and install spring over push rod, and install spring guide on spring (if so equipped).
10. Install cover over push rod and into body. Attach cover to body with cap screws, tightening securely.
11. Install boot over push rod attaching to cover.
12. Install lock nut and yoke on push rod.

TESTING OF REBUILT ROTOCHAMBER

Perform "Operating and Leakage" checks.

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times.

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.**
2. **Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.**
3. **Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
4. **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS™ air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.**
5. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
6. **Never exceed manufacturer's recommended pressures.**
7. **Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.**
8. **Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.**
9. **Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.**
10. **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**

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Haldex

L30036
Rev. 5/03

SERVICE MANUAL

Transit and Coach Applications

AUTOMATIC BRAKE ADJUSTERS

Innovative Vehicle Technology

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Important Notice
This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and/or component damage.

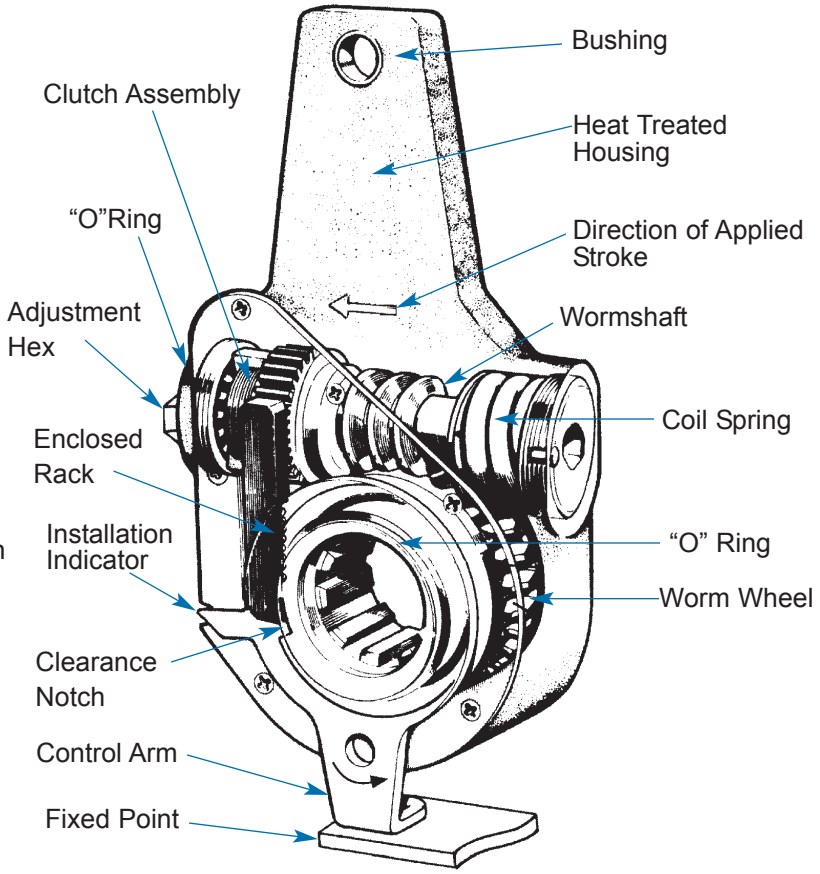
The description and specifications contained in this service publication are current at the time of printing. Haldex Brake Products Corp. reserves the right to discontinue or modify its models and/or procedures and to change specifications at any time without notice.

Operation

The Haldex automatic brake adjuster is a clearance sensing brake adjuster that maintains a nominal distance or clearance between lining and drum.

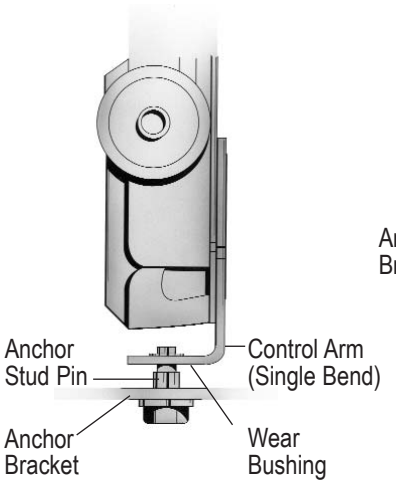
When the Brake Applies:
Upon brake application, the brake adjuster rotates and moves the shoes into contact with the drum. The clearance notch corresponds to the normal lining-to-drum clearance. As the brake application continues, the rack moves upward and rotates the one-way clutch which slips in this direction. As the brake torque increases, the coil spring load is overcome and the wormshaft is displaced axially, releasing the cone clutch.

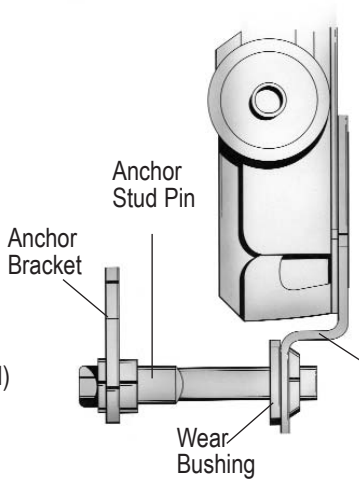
When the Brake Releases:
When the brake begins its return stroke, the coil spring load returns to normal and the cone clutch is again engaged. The rack is pulled back to its original position in the notch, and any additional travel brought about by lining wear causes the rack to turn the locked one-way clutch and rotates the wormshaft through the locked cone clutch. The wormshaft then rotates the worm wheel and camshaft, adjusting the brakes.

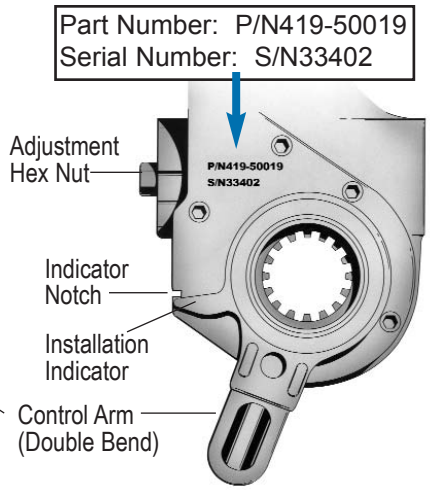


Typical Parts Identification and Location

Part Number Identification:	Part Number Identification:	Serial Number Identification:
300-10xxx = Standard service adjuster kit	419-10xxx = Standard service adjuster	First 3 digits = Day of year built
300-50xxx = Severe service adjuster kit	419-50xxx = Severe service adjuster	Last 2 digits = Year of build







Typical Applications

Steer Axle
Figures 1–3 show typical brackets for automatic brake adjuster applications on steer axle brake assemblies. Refer to pages 4 and 5 for detailed installation procedures.

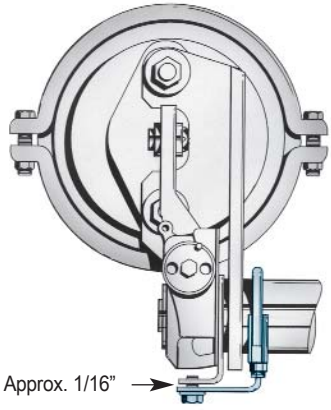


Figure 1
Steer axle with clamp bracket and round anchor stud

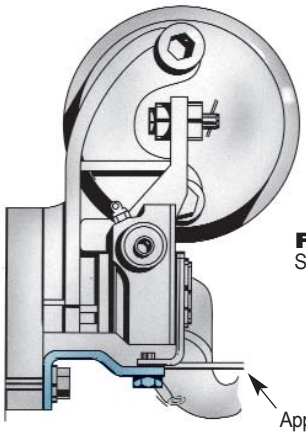


Figure 2
Spider mount

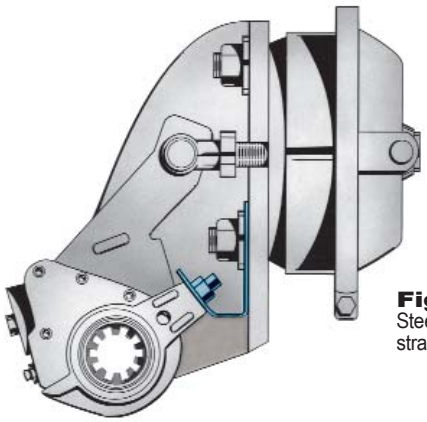


Figure 3
Steer axle with strap bracket

Drive Axle
Figures 4-6 show typical brackets for automatic brake adjuster applications on drive axle brake assemblies. Refer to pages 4 and 5 for detailed installation procedures.

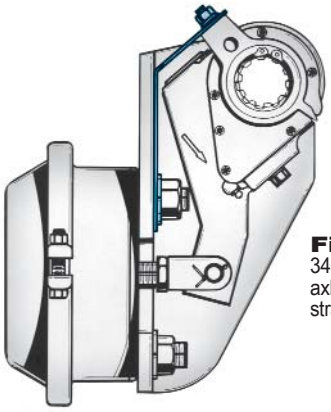


Figure 4
34° drive axle with strap bracket

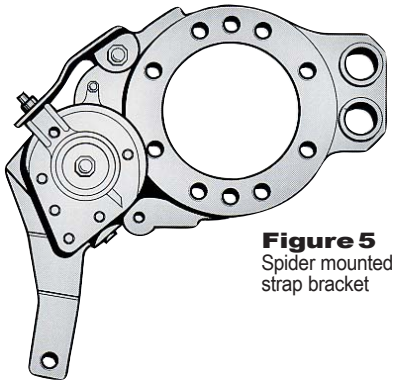


Figure 5
Spider mounted strap bracket

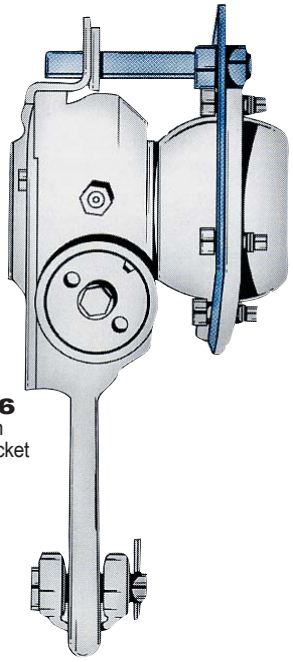


Figure 6
Integral cam support bracket

Note: Refer to fundamental parts identification and location on page 8.

Installation Procedures

Note: Configuration of anchor bracket and brake adjuster housing may vary, depending upon axle. Refer to typical applications on Page 2.

Step 1

Note: Block wheels to prevent vehicle from rolling. Ensure system tank pressure is above 100 PSI.

- Check that the push rod is fully retracted; apply air to release spring brake. If air is not available, spring brake must be manually caged back.
- Install anchor bracket loosely as illustrated (fig. 7).
- Some strap brackets have two mounting holes. Proper mounting location is determined by the length of adjuster arm. 5" and 5-1/2" adjuster arm lengths utilize the shorter hole location while 6" and 6-1/2" length adjusters utilize the longer hole locations.
- Do not tighten anchor bracket fasteners at this time.
- Apply “Anti-Seize” type lubricant to camshaft splines.

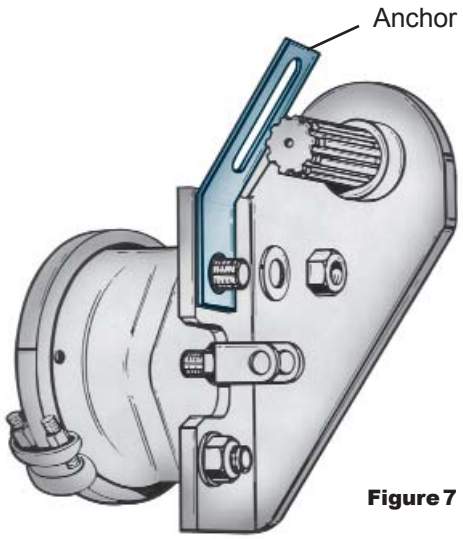


Figure 7

Step 2

- Install the brake adjuster onto the camshaft with the adjusting hex pointing away from the brake chamber (fig. 8).
- Secure the brake adjuster on the camshaft. Use at least one inner washer and enough outer washers to allow no more than .060 movement of adjuster on camshaft. (Per TMC recommended practice RP609-A.)

Note: Do NOT pull push rod out to meet the brake adjuster.

- Rotate the 7/16" adjusting hex nut CLOCKWISE until the clevis hole lines up with the brake adjuster arm hole.
- Apply anti-seize to clevis pin, install and secure with cotter pin.

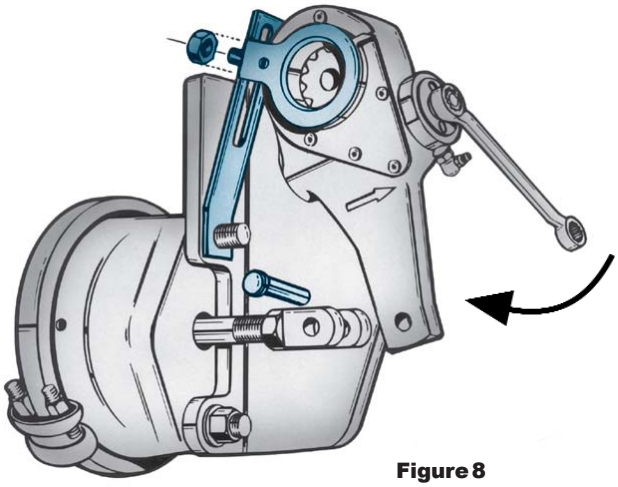


Figure 8

Installation Procedures

Step 3

- Rotate the control arm away from the adjusting hex toward the air chamber, until it comes to a definite internal stop (fig. 9).
- Most adjusters will be equipped with an "Installation Indicator." Indicator must fall within the slot for proper installation with brakes fully released (fig. 10).
- **If the control arm position is wrong, tight brakes will occur (fig. 11).**
- Tighten all anchor bracket fasteners (make sure the control arm does not move from its position while tightening fasteners).

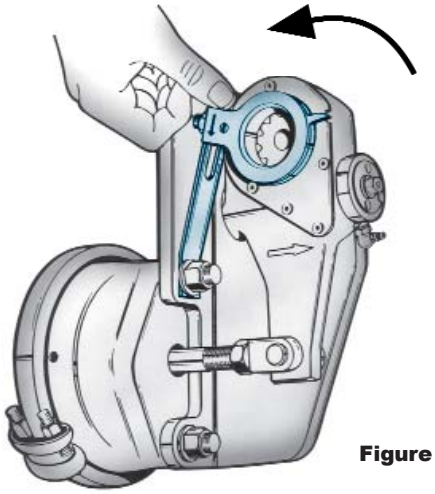


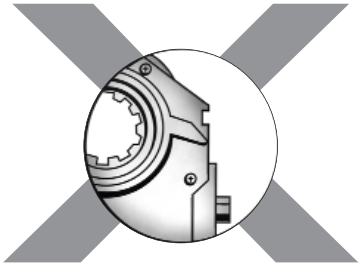
Figure 9

Step 4

- The adjuster must be manually adjusted at this time.
- Rotate the adjusting hex clockwise until the lining lightly contacts the drum.
- Then back-off the adjuster by turning the adjusting hex counter-clockwise 1/2 of a turn (fig. 12).
- A minimum of 13 ft. lbs. is necessary to overcome the internal clutch. A ratcheting sound will be present.
- **Do NOT use an impact wrench or internal damage will occur!**
- **FINAL INSPECTION.** With full service brake application, assure that spring brakes are released, and check that the "Installation Indicator" is within the slotted area. **IF NOT, REPEAT Step 3.**

Note: To ensure proper fit and function, always replace both adjuster and mounting bracket.

Correct
(Brakes released)
Figure 10



INCORRECT
(Brakes released)
Figure 11

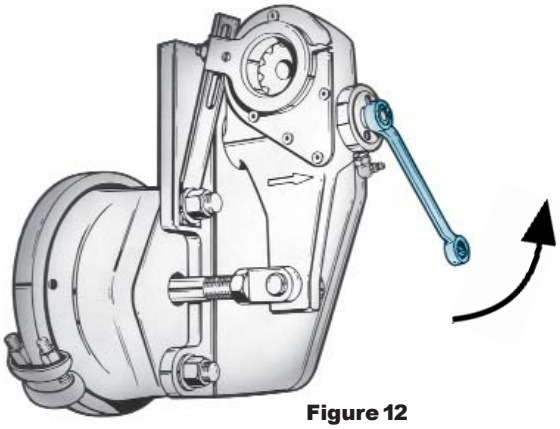


Figure 12

Routine Visual/Operational Checks

- **Haldex strongly recommends that routine visual/operational checks, including brackets and control arms, be performed at each Preventative Maintenance Service Interval.**
- **Adjusters or anchor brackets that have visual damage, or which fail the operational checks, MUST be replaced immediately.**
- **Automatic adjusters should not be operated as manual adjusters except as may be necessary to get the vehicle off the road for service.**

Service and Lubrication Intervals

Adjuster Type	Lubrication Interval	Type of Lubricant	Visual Check Interval
Standard Brake Adjuster 419-10...	4,000 to 6,000 miles or every 3 months	Standard Chassis Grease	Each Preventative Maintenance Service Interval

Notes:

Moly-disulfide grease should not be used because it may affect the function of the internal friction clutches and reduce the reliability of the automatic adjustment.

In no case should the lubrication interval exceed the published intervals shown above.

Every automatic brake adjuster requires inspection at periodic intervals. This inspection should coincide with the vehicle inspection program where norman vehicle lubrication intervals are scheduled or recommended by the vehicle manufacturer. Perform the following during these intervals:

1. Measure air chamber push-rod stroke @ 90 to 100 PSI per CVSA and DOT requirements.
2. Record stroke measurements to within 1/16” and enter into inspection records.
3. Grease each brake adjuster. Note: Some automatic brake adjuster models manufactured by Haldex do not require grease. A hex plug may be installed into the adjuster casting to replace a grease fitting. If present, do not remove hex plug. Contact Haldex if uncertain or require additional information.
4. Visually inspect each brake adjuster for integrity and control arm connection to the associated bracket.

If air chamber stroke exceeds CVSA or DOT maximum allowances, do not manually adjust the brake adjuster. See “Troubleshooting Procedures” on page 5 to determine if the adjuster requires replacement.

MANUAL ADJUSTMENT TO THE BRAKE ADJUSTER COULD SHORTEN CLUTCH LIFE AND MAY VOID THE WARRANTY.

Foundation Brake Operational Check and Troubleshooting

Note: ■ Block wheels to prevent vehicle from rolling.
■ Ensure system tank pressure is at 90-100 psi.
■ Check that push rod is fully retracted; apply air to release spring brake.

North American Commercial Vehicle Safety Alliance (CVSA) Uniform Vehicle Inspection Criteria

The applied stroke of the brake should be checked per CVSA guidelines at 90-100 PSI reservoir pressure. **Applied stroke** should be at or less than the specified adjustment limits as follows:

Standard Clamp Type Brake Chamber

Type	Adjustment Limit	Type	Adjustment Limit
9	1-3/8"	24	1-3/4"
12	1-3/8"	30	2"
16	1-3/4"	36	2-1/4"
20	1-3/4"	DD-3	2-1/4"

Long Stroke Type Brake Chamber

Type	Adjustment Limit	Type	Adjustment Limit
16L	2"	24L3	2-1/2"
20L	2"	30L3	2-1/2"
24L	2"		

NOTE: Long stroke chambers are identified with square air ports or port bosses and special trapezoid ID tags.

Free Stroke

Measuring the Free Stroke

Free stroke is the amount of movement of the adjuster arm required to move the brake shoes against the drum. With brakes released, measure from the face of the chamber to the center of the clevis pin “A” (fig. 13). Use a lever to move the brake adjuster until the brake shoes contact the drum “B” (fig. 13). The difference between the fully retracted and drum contact measurement “B”–“A” (fig. 13), is the free stroke. The free stroke range should fall between 3/8"–3/4".

Free Stroke Within Range

If the free stroke is good, but the applied stroke is too long, there is probably a problem with the foundation brake. Check the following and reference CVSA out-of-service criteria:

Component	Cause	Action
Brake drums	Cracked or out of round	Replace or check drum run out
Brake shoes	Shoe span out of spec	Refer to OEM specs and replace if necessary
Brake shoes	Uneven lining wear	Check spider concentricity
Brake shoes	Shoe pad missing	Remove & replace shoes
Brake shoes	Cracked shoes	Remove & replace shoes
Cam bushings	Excessive movement	Remove & replace cam bushings per OEM specs
Camshaft	Flat spots on cam head	Replace camshaft
Camshaft	Cracked/broken splines	Replace camshaft
Camshaft	Worn bearing journals	Replace camshaft
Chamber bracket	Broken/bent	Replace bracket
Clevis yoke and pin	Worn	Remove & replace
Return springs	Broken/stretched or missing	Remove & replace springs
Rollers	Flat spots, grooved pin/worn	Remove & replace roller and pin
Rollers	Wrong size	Remove & replace with correct parts
Spider anchor pins	Grooved or scored/worn	Replace spider or pins, as appropriate for OEM

Free Stroke Above the Range

If the free stroke is above the range and the applied stroke is too long, there is a problem with the foundation brake or the adjuster. Check the following:

Component	Cause	Action
Camshaft	Binding	Remove, replace, lubricate camshaft
Camshaft bushings	Excessive movement	Remove and replace cam bushings per OEM specs
Camshaft bushings	Binding shaft	Lubricate camshaft bushings or replace
Air chamber return springs	Broken, weak, missing	Replace chamber
Air chamber push rod	Binding on chamber housing	Check adjuster for proper shimming and air chamber position for proper adjuster arm length
Air system	Not exhausting completely	Check for cause of air problem and repair
Shoe return springs	Broken, weak, missing	Replace springs
Automatic brake adjuster	Unknown	Check automatic brake adjuster for proper installation. Refer to Installation Instructions on pages 3 & 4.
Automatic brake adjuster	Unknown	Refer to Automatic Brake Adjuster Checking Procedures and Operational Check on pages 8 & 9.

Free Stroke Below the Range

If the free stroke is less than 3/8", a dragging brake can occur. Check the following:

Component	Cause	Action
Wheel bearing	Out of adjustment	Readjust per OEM specs
Automatic brake adjuster	Unknown	Check automatic brake adjuster for proper control arm position. Refer to Installation Instructions on pages 3 & 4.
Automatic brake adjuster	Unknown	Refer to Automatic Brake Adjuster Checking Procedures and Operational Check on pages 8 & 9.

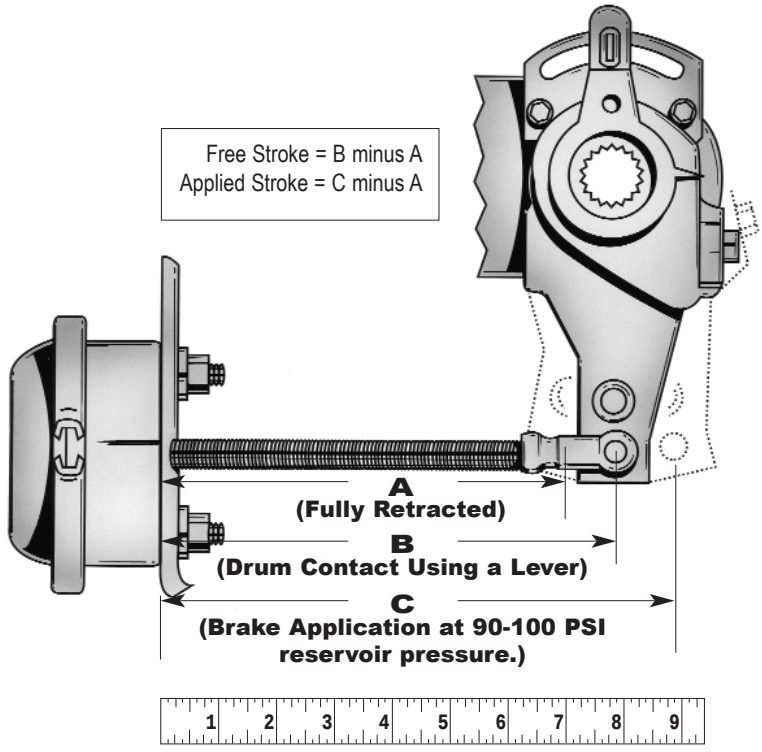


Figure 13
Stroke Measurements
(taken from face of air chamber to center of clevis pin)

Automatic Brake Adjuster Checking Procedures

If the brake adjuster is not maintaining the proper applied stroke, before removing the brake adjuster, check the condition of the foundation brake (see pages 6 & 7). **If after inspecting the foundation brake** no apparent problems are found, inspect the automatic brake adjuster to determine if it is operating properly. The inspection can be performed on or off the vehicle using the following procedures.

Note:

- Block wheels to prevent vehicle from rolling.
- Ensure system tank pressure is at 90-100 PSI.
- Check that push rod is fully retracted; apply air to release spring brake.
- If air is not available, spring brake must be manually caged back.
- Do not use air tools on brake adjuster!

On Vehicle Inspection

Component	Cause	Action
Tight or dragging brakes	Control arm mispositioned	Realign control arm and anchor bracket. Check installation procedures on pages 3 & 4.
Excessive chamber push rod travel	Improper anchor bracket connection to control arm	If anchor bracket to control arm connection is worn, loose, bent or broken, it must be re-secured or replaced.
	Low clutch torque	Rotate the 7/16" adjustment hex one full turn counterclockwise. Replace brake adjuster if the torque is less than 13 ft. lbs. or no racheting sound occurs.
	Unknown	Perform automatic brake adjuster operational check (see below).

Off Vehicle Inspection

Component	Cause	Action
Adjuster not functioning properly	Low clutch torque	Place adjuster arm in vise. Rotate the 7/16" adjustment hex counterclockwise one full turn to check de-adjustment torque. After control arm stops rotating, a minimum of 13 ft. lbs. will be required and a ratcheting sound will occur. Replace brake adjuster if the torque is less than 13 ft. lbs. or no de-adjustment ratcheting sound is present.
	Control Arm slippage	Place adjuster arm in vise. Rotate the control arm counterclockwise until the control arm rotates to an INTERNAL STOP. If the installation indicator goes past the indicator notch or does not stop rotating (arm slips freely), replace the brake adjuster.
	Unknown	If torque is above 13 ft. lbs., scribe a line on the adjustment hex. Manually pull the brake adjuster control arm clockwise then push back counter-clockwise until the installation indicator stops in the indicator notch. The hex will move in a clockwise direction when the control arm of the brake adjuster is pushed back counterclockwise. Replace adjuster is hex does not move.
	Worn/missing control arm wear bushing, and anchor stud pin, if applicable.	Remove and replace pin and bushings. If adjuster has passed the above checks, re-install adjuster on vehicle, with new hardware.

Automatic Brake Adjuster Operational Check

Functional operation of the brake adjuster can be performed on the vehicle by using the following procedure:

- Block wheels to prevent vehicle from rolling.
- Ensure tank pressure is at 90-100 psi.
- Check that the push rod is fully retracted; apply air to release spring brake. If air is not available, spring brake must be manually caged back.

Manually de-adjust brakes (turn adjustment hex counterclockwise one full turn) to create an excessive drum to lining clearance condition. (A ratcheting sound should occur.)

Make a full service brake application. On release, allow sufficient time for brake to fully retract.

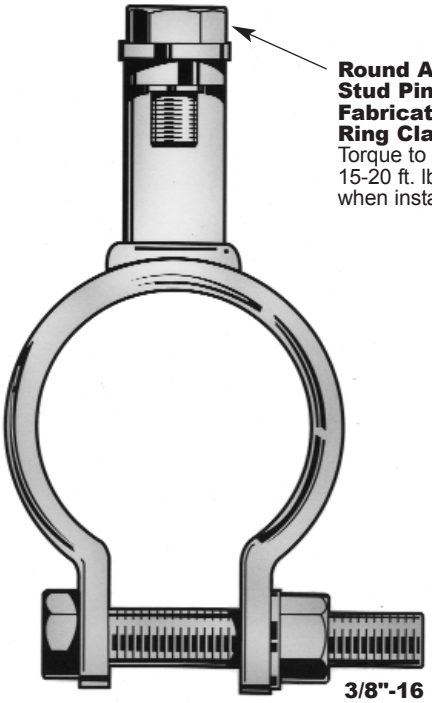
During the brake release, observe rotation of the adjustment hex (attaching a wrench on the hex or scribing the hex will make this rotation easier to see).

This rotation indicates that an excessive clearance condition has been determined by the brake adjuster, and it is making an adjustment to compensate. On each subsequent brake release, the amount of adjustment and push rod travel will be reduced until the desired clearance is achieved.

If rotation of the adjustment hex is not observed, refer to Foundation Brake Operational Check and Troubleshooting Procedures on pages 6 & 7. If foundation brake assembly checks out okay and hex still does not turn, check control arm and mounting bracket for possible worn, bent or broken components. If the control arm and mounting bracket check out okay, replace the adjuster and hardware per procedures on pages 3 & 4.

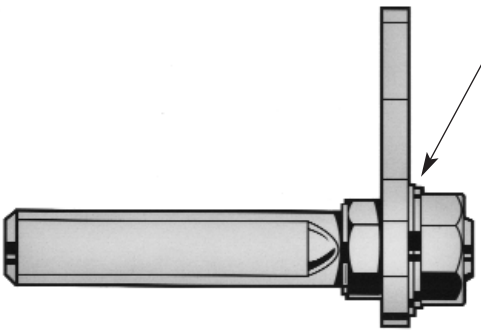
Torque Specifications

Note: Tighten all fasteners to manufacturer's recommendations unless otherwise specified below.

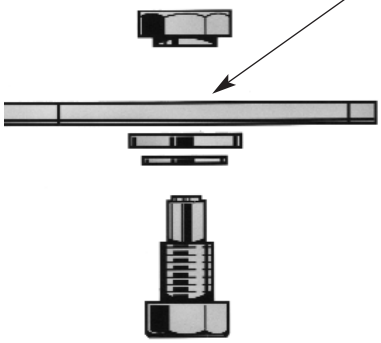


Round Anchor Stud Pin with Fabricated Ring Clamp
Torque to 15-20 ft. lbs. when installed

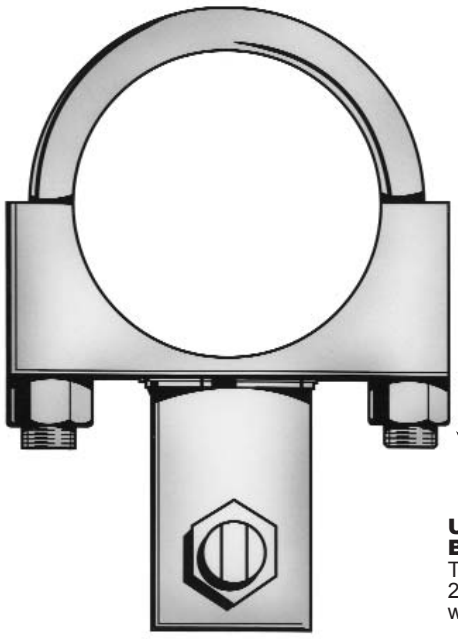
3/8"-16 Nut and Bolt
Torque to 15-20 ft. lbs. when installed



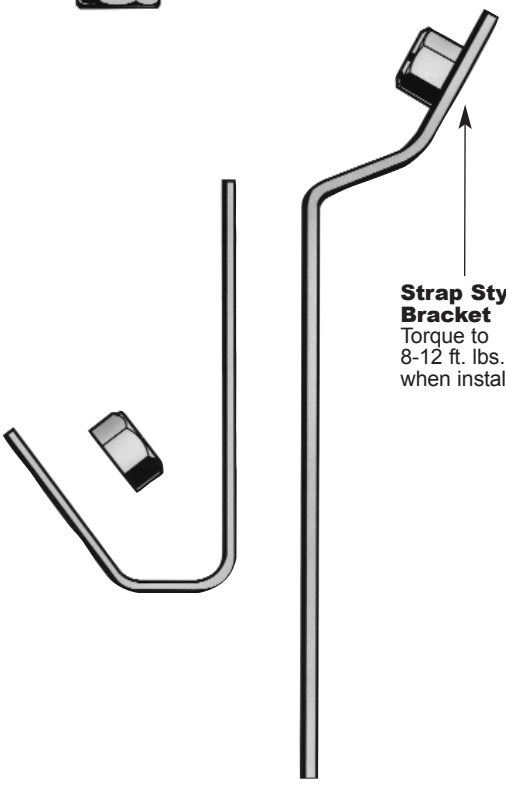
Flat Anchor Stud Pin
Torque to 40-50 ft. lbs. when installed



Round Anchor Stud Pin with Slide Nut
Torque to 15-20 ft. lbs. when installed



U-Bolt Style Bracket
Torque to 20-30 ft. lbs. when installed



Strap Style Bracket
Torque to 8-12 ft. lbs. when installed

Frequently Asked Questions

1. Will the side of the brake adjuster with the installation indicator always face in?

No. Haldex adjusters are normally unhanded. Always install with the adjusting hex pointing away from the air chamber.

2. My adjuster doesn't have an installation indicator; should I be concerned?

No. A few applications aren't manufactured with installation indicators. However, the set-up and function are the same regardless. Refer to pages 3 & 4 for proper installation procedures.

3. Why is there resistance when backing off the adjuster?

It takes approximately 20-25 lb. ft. of torque to back off the adjustment hex. (A ratcheting sound should occur.)

4. How far do I back off the automatic brake adjuster at a brake reline?

1/2 turn. (NOTE: for the first 1/8 turn you may not hear the ratcheting; this is normal.)

5. How do I know if I need an offset, angled or straight-armed adjuster?

Haldex manufactures the right adjuster arm for your specific application. Haldex adjusters are unhanded (no lefts or rights) in the majority of applications. Please refer to the Haldex Parts and Cross Reference Guide for your specific application (L00090).

6. Why does my replacement ABA look different from the original I took off?

The Haldex ABA replacement adjuster has been designed to fit a number of applications. It is the same original equipment quality and design of the adjuster you removed; however, it may look different on the outside. If you use all the parts included in the kit, the results will be the same as the original equipment adjuster.

7. Why is the applied stroke pressure range 90-100 psi at the reservoir?

This is the pressure recommended by the CVSA (Commercial Vehicle Safety Alliance). Anything beyond 100 psi measures deflection within the foundation brake and not true push rod stroke.

8. Some brake chambers have round port openings and some square; what is the difference?

Standard brake chambers are identified by round ports. Long stroke chambers are identified by square ports and trapezoid ID tags.

9. Can I vary the amount of lining-to-drum clearance by moving the control arm?

No, that clearance is set at the factory. If long or short stroke continues, please refer to the foundation brake checking procedures on pages 6 & 7 of this manual.

10. Can I use an air ratchet on the adjuster?

No. It will damage the internal mechanism of the adjuster and render it inoperative.

11. Can I access the adjuster through the rear cover?

No, do not tamper with the rear cover—it will release the factory set pressure on the spring and destroy the adjuster and its ability to properly function.

12. How much control arm bushing and anchor stud pin wear is acceptable before replacement is required?

No more than 1/16."

13. What is the acceptable amount of camshaft bushing wear?

Automatic adjusters cannot compensate for worn foundation brake parts. Please refer to the foundation brake manufacturer's recommendations for maximum bushing and camshaft wear limits.

14. Can wheel bearing adjustment affect the brake adjuster?

Yes. Improper wheel bearing adjustment could result in improper brake adjustment. It is necessary to refer to the axle manufacturer's wheel bearing adjustment recommendations. A loose bearing preload could cause a tight brake.

(continued on page 12)

Frequently Asked Questions (continued)

15. Are all Haldex automatic brake adjusters pre-lubed?

Yes. All Haldex brake adjusters are lubricated at the factory. Please consult the Service and Lubrication Section on Page 5 for proper lubrication guidelines.

16. Can I use moly lube with the Haldex automatic brake adjuster?

No. A high concentration of moly-disulfide can lower the friction capabilities in the adjusting clutch parts and decrease automatic adjustment reliability.

17. Can I purchase anchor bracket wear items separately (i.e., anchor stud pins, wear bushings)?

Yes. Normal wear items like anchor stud pins and wear bushings are available. Please refer to the Haldex Parts and Cross Reference Guide for your specific application (L00090). Otherwise, contact Haldex Technical Assistance for the appropriate bracket kit at 1-800-643-2374.

18. Does the control arm need to be properly set and secured?

Yes. Without proper placement and attachment, the adjuster will not function properly. Make sure the control arm, anchor bracket and wear items are in good working order to assure the adjuster will operate as designed.

19. If automatic adjustment stops, can I operate as a manual brake adjuster?

No. Completely check out foundation brake and adjuster to determine cause of problem. Repair or replace as needed to restore automatic adjustment.

Additional Information Available

Additional parts and service information on Haldex Automatic Brake Adjusters may be found in the following materials:

Service Information

Installation and Maintenance Wall Chart	L60047HBS
Installation Video	ABA10017
Service Manual (Truck/Trailer)	L30033HBS

Parts Information

Parts and Cross Reference Guide	L00090
Supplemental Automatic Brake Adjuster Kits	L20447

These materials may be ordered by contacting your Customer Service Representative at 1-800-643-2374. Or, you may log in to our website www.hbsna.com with your customer password to place your order.

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Fax: (519) 826-9497

www.haldex.com — www.hbsna.com

Rev. 5/03 5M CUT L30036

Holland
GO THE DISTANCE.

KINGPIN

REMOVABLE KINGPIN SPECIFICATIONS

Holland

HOLLAND HITCH COMPANY REMOVABLE KINGPINS PROVIDE:

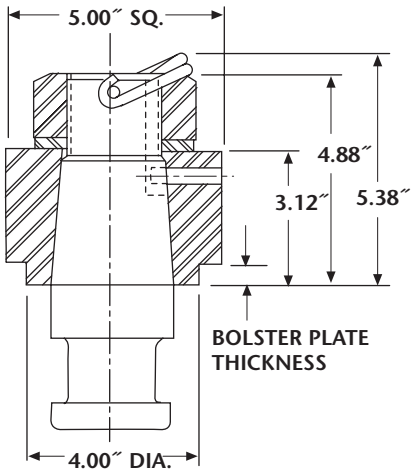
- Multiple kingpin settings to vary weight distribution and overall length.
- A tapered design for secure installation and quick removal to prevent kingpin damage (as may occur with folding goosenecks) and to ease kingpin replacement.

This series of kingpins is specifically designed for gooseneck, drop-frame and flatbed trailers but can be used for van and enclosed trailers if access is provided through the floor.

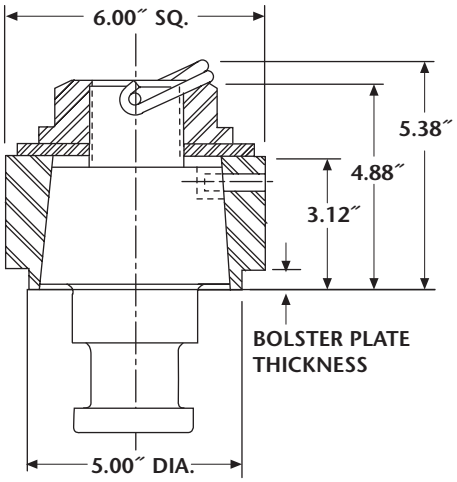
STANDARD FEATURES INCLUDE:

1. Kingpins of AISI 4140 steel, quenched and tempered for wear and strength.
2. Tapered engagement with the housing for firm, secure installation.
3. Locking dowel pin to prevent rotation – an aid in installation and removal.
4. Two models - one for standard 2″ SAE kingpins and one which is convertible from 2″ to 3.5″.
5. Housings with protective plugs are sold separately and are available for multiple positions.
6. Bolster plate thicknesses are designed into the housings as shown below. Only one kingpin of the proper configuration is required if replacement is necessary.

DIMENSIONS



2″ KINGPIN WITH HOUSING	HOUSING WITH PLUG	BOLSTER PLATE
KP-0427	KP-0438	0.25″
KP-0428	KP-0439	0.31″
KP-0412	KP-0440	0.38″
KP-0429	KP-0441	0.50″



2″ KINGPIN WITH HOUSING	3½″ KINGPIN WITH HOUSING	HOUSING WITH PLUG	BOLSTER PLATE
KP-0413	KP-0414	KP-0444	0.38″
KP-0432	KP-0433	KP-0445	0.50″

HOUSING INSTALLATION RECOMMENDATIONS:

1. The housing is designed for welded installation into the upper coupler assembly. The design of the upper coupler is the responsibility of the installer and must be consistent with the type and capacity of trailer and design loads for the upper coupler.
2. The housing is manufactured from AISI 1020 steel which is readily weldable; a low-hydrogen welding process is recommended. The "square" external shape of the housing will aid the attachment of required bracing or cross members.
3. Since the tapered hole in the housing is accurately machined, a welding procedure which alternates from side to side and which minimizes heat buildup is recommended to avoid distortion. The hole should also be protected from weld spatter during coupler construction.
4. An access opening must be provided through the trailer floor for field removal and installation of the kingpin.

KINGPIN INSTALLATION INSTRUCTIONS:

WARNING

The trailer must be securely chocked and supported to prevent the trailer from rolling or falling onto the installer.

1. Clean all foreign material from the housing and the kingpin. The application of a ***VERY THIN*** coating of rust preventative lubricant to the kingpin prior to installation will aid subsequent removal.
2. Insert the kingpin into the housing, aligning the dowel pin in the housing with the key slot on the kingpin. Hold in place while the washer and nut are installed by a helper from above.
3. Tighten the nut to a minimum of 300 foot pounds and install retaining pin through the castellations of the nut.

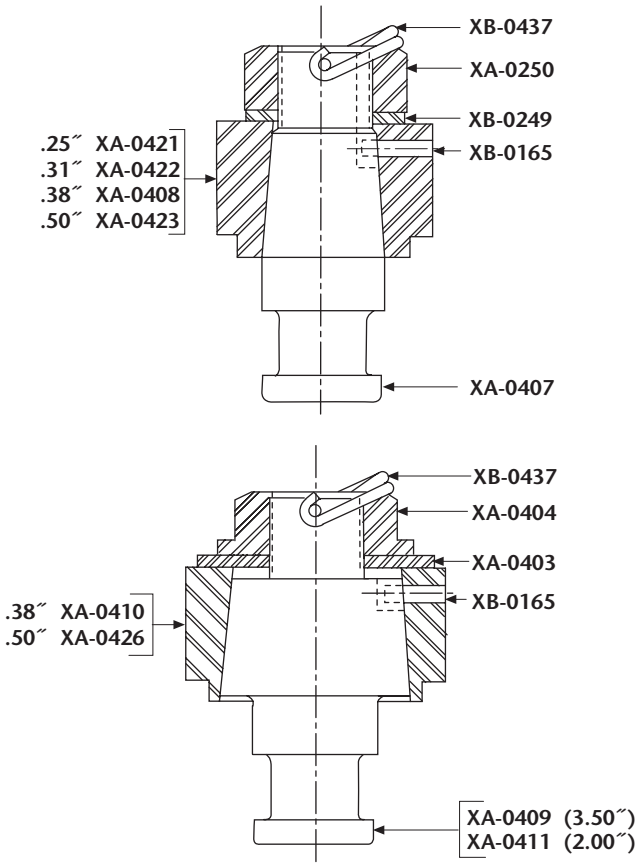
IMPORTANT

The kingpin must be checked periodically during use and retightened to proper torque if necessary.

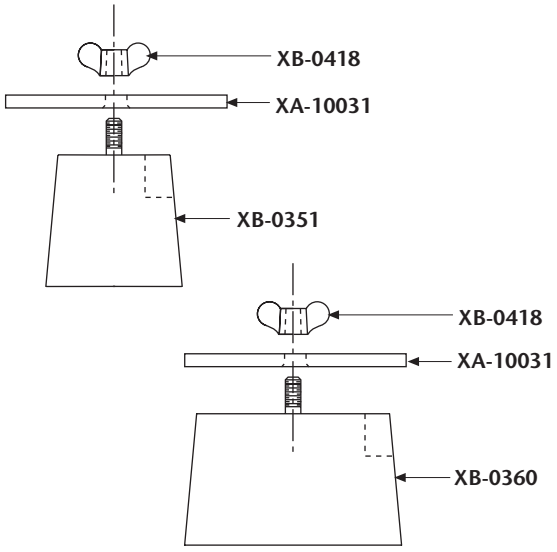
4. Housing plugs are recommended to minimize corrosion and contamination when a kingpin is not installed in the housing. The plug is installed in a similar manner but is retained with a finger-tight thumb nut.

These products are covered by Holland's Commercial Products Warranty. Holland reserves the right, without giving prior notice, to change specifications and dimensions as designs are altered or improved.

PARTS BREAKDOWN



KINGPIN PLUGS



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Holland International, Inc.
Holland, MI
Phone: 616-396-6501
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Holland Hitch of Canada, Ltd.
Woodstock, Ontario • Canada
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Fax: 800-565-7753

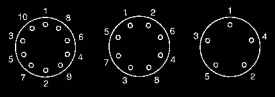
Holland Equipment, Ltd.
Norwich, Ontario • Canada
Phone: 519-863-3414
Fax: 519-863-2398

Holland Hitch Western, Ltd.
Surrey, British Columbia • Canada
Phone: 604-574-7491
Fax: 604-574-0244

WHEEL SERVICE MANUAL

SAFETY AND MAINTENANCE INSTRUCTIONS
JANUARY 2007

HEAVY DUTY TRUCK | LIGHT DUTY TRUCK | TRAILER | BUS | MOTOR HOME



ALCOA WHEELS

LIMITED WARRANTY

FOR HEAVY DUTY TRUCK, TRUCK TRAILER,
BUS, RV and MOTORHOME WHEELS

(Wheels with bead seat diameters measured in .5 inch increments and Alcoa tube type wheels)

Alcoa warrants to the original purchaser, from Alcoa or its authorized distributor, that a new Alcoa aluminum disc heavy duty truck, truck trailer, bus, 19.5-inch and 22.5-inch RV or motorhome wheel is free from defects in material and workmanship. Alcoa agrees, without charge, to repair or replace a wheel that fails in normal use and service because of defects in material and workmanship. Truck, truck trailer, Dura-Flange® and the Dura-Bright® surface treatment wheels not used in transit service are warranted for 60 months from the date of manufacture as shown on the wheel except the Dura-Flange® rim flange treatment is warranted for a period of 24 months. Alcoa bus mount wheels (10-hole, 11.25 inch bolt circle, 8.670 inch hub bore with 1.22 inch diameter bolt holes) and other wheels used in transit service are warranted for 120 months from date of manufacture, except the Dura-Bright® surface treatment on bus and transit service wheels is warranted for a period of 60 months from the date of manufacture and the Dura-Flange® rim flange treatment is warranted for 24 months. Satin finish, polished and Dura-Bright® surface treatment 19.5-inch and 22.5-inch RV and motorhome wheels are warranted for 120 months from the date of manufacture as shown on the wheel. Alcoa does not warrant and will not repair or replace or make adjustment with respect to any wheel that has been subjected to misuse or abuse including the following:

(a) Using a tire that is oversized according to standards recommended by the Tire and Rim Association, Inc. or other recognized tire and rim agencies such as ETRTO (Europe) or others;

(b) Loading the wheel beyond the applicable maximum wheel load as specified by Alcoa;

(c) Inflating beyond the applicable maximum as specified by Alcoa;

(d) Changing the original condition of the wheel by alteration or by subjecting it to any processing such as welding or straightening.

(e) Accidents, abnormal or severe operating conditions including without limitation tire fires, brake fires, severe brake system drags or seizures or running with a flat tire; or

(f) Failure to follow maintenance and other instructions and warnings set forth in the Alcoa Heavy Duty Wheel Service Manual, Alcoa Technical Bulletins and other Alcoa literature. Recommended maintenance includes, without limitation, using proper torque, periodic cleaning, polishing, valve replacement, periodic inspection for damage, loose lug nuts and rim flange wear inspections and procedures.

(g) Nicks, scratches and other surface blemishes resulting from improper maintenance, cleaning, road debris, curbing, accident or operation are not warrantable.

(h) Damage due to cleaning with abrasives, abrasive brushes, steel wool, scouring pads, or strong chemicals (acids or alkaline).

Dura-Bright® Surface Treated Wheels are warranted against:

(a) Filiform corrosion (worm or hair like lines, generally milky in appearance, underneath surface protective treatment and emanating from damage to the surface treatment such as nicks, scratches or damage from mounting hardware or wheel weights)

(b) Blistering due to loss of adhesion of the surface treatment,

(c) Lift off of the surface treatment due to physical damage (nicks, scratches, gouges)

If nicks, dings, scratches or other damage does occur to the Dura-Bright® treatment that exposes the aluminum underneath, the metal exposed may naturally oxidize, but any corrosion will be confined to the metal exposed and will not extend into or underneath the Dura-Bright® treatment.

Normally, any washing materials or chemicals (including mild acid washes) that can safely be used on a vehicle, its painted surfaces and components, can safely be used on the Dura-Bright® surface treatment. The Dura-Bright® treatment prevents corrosion of aluminum wheels and protects their shine. So long as the treatment remains in place (see comments (g) and (h) above) and is maintained in accordance with the Alcoa Dura-Bright® Care and Maintenance manual, it is warranted against corrosion. If corrosion does occur within the treatment warranty period, subject to the limitations stated above, Alcoa will replace any wheel exhibiting such corrosion.

There is no warranty that the wheel shall be merchantable or fit for any particular purpose, nor is there any other warranty, express or implied, except such as is expressly set forth herein.

Alcoa shall not be liable for any incidental or consequential damages for any breach of warranty, its liability and the purchaser's exclusive remedy being limited to repair or replacement of the wheel as stated in this limited warranty.

Alcoa Wheel Service Manual. This limited warranty should be used in conjunction with the Alcoa Wheel Service Manual and the Alcoa Dura-Bright® Wheel Finish Care and Maintenance Manual. The Wheel Service Manual contains important safety information and warnings, and failure to read and understand this information may result in serious injury or death. The limited warranty is included with the Wheel Service Manual, but may appear elsewhere. If you do not have copies of the Wheel Service Manual you may obtain copies free of charge from Alcoa Wheel Products, 1600 Harvard Avenue, Cleveland, Ohio 44105, (800) 242-9898 and on the web at www.alcoawheels.com.

WARNING Wheels that are not properly installed or maintained may not work properly.

Failure to follow proper wheel installation or maintenance practices may result in injury or death.

Follow the proper wheel installation and maintenance practices as contained in this Alcoa Service Manual. For additional copies of the manual and other useful items listed below, available free of charge, or for the most recent updates, contact Alcoa Wheel Products at 1-800-242-9898 option 1 or on the web at www.alcoawheels.com.

To obtain information on free training on proper installation and maintenance procedures, contact Alcoa Wheel Products at (800) 242-9898 option 1 or on the web at www.alcoawheels.com.

Important information available free from Alcoa:

Alcoa Wheel Service Manuals
- Disc Wheel Service Manual
- Flat Base Wheel Service Manual for Tube Type Tires

Videos
- Safe Wheel and Tire Changing Practices for Heavy Duty Trucks and Buses
- Maintaining Your Edge Rim Flange Maintenance
- Simple Facts about Hub-Piloted Wheel System Maintenance

Maintenance Charts
- Zipper Rupture Published by RMA
- Tire Information Service Bulletin Published by RMA
- Heavy & Medium Truck & Trailer Torque Specifications Published by WRIS
- Demounting & Mounting Procedures for Truck/Bus Tires Published by RMA
- Multipiece Rim Matching Chart Published by OSHA
- Mounting/Demounting Instructions for Alcoa Aluminum 19.5" RW Published by Alcoa Wheel Products
- Wheels and Steel Disc 19.5" Wheels Published by Alcoa Wheel Products

Alcoa Rim Flange Safety Material
- Maintaining Alcoa Aluminum Wheels Rim Flange Wear Instructions
- Rim Flange Wear Gauge
- Alcoa Technical Bulletin (dated Nov 10, 1997) Rim Flange Wear

Table of Contents

How to use this manual

This manual is written in a style called structured text.

Throughout the manual you will find numbers which look like this (See Section 3-1). These numbers are cross references to other sections of the manual. The numbers (3-1) refer to section 3, subtopic 1. You will find the section number and subtopic number under the heading in each section.

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1 Safety

Safe service practices are a matter of life and death.

1-1

WARNING An inflated wheel and tire assembly contains enough air pressure to cause an explosive separation.

Unsafe handling or failure to follow approved mounting and demounting procedures can lead to serious injury or death.

Study, understand and follow the procedures contained in this manual.

Safety is serious business. All tire shops must know and follow OSHA work regulations ... no matter how small the shop.

Safety is everybody's business. Do not attempt to service any wheel assembly without proper training.

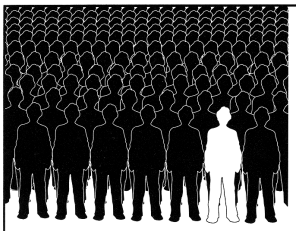
Proper equipment is important. Be sure you have the recommended tools and equipment on hand and use them according to manufacturer's instructions.

Tubeless wheels and tires require equal care. Even though tubeless assemblies have fewer parts than multi-piece wheels, they still require respect and proper handling.

Pay particular attention during crucial steps:

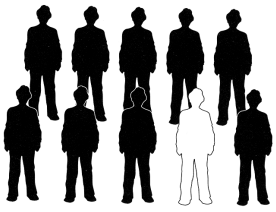
- Removal of tire and wheel assemblies from vehicles
- Demounting tire from wheel
- Inflation of tire
- Handling and storing of inflated assembly

Safety and service information is readily available. Wheel, tire and service equipment manufacturers offer service manuals and other training materials. Stay up to date on proper procedures and keep current instructional materials handy in the shop. Study safety and service information and use it on the job.



1 in 1000
TYPICAL INDUSTRY

Statistics show that in most industries, at worst, only one in 1000 serious accidents result in a fatality. But when the accident involves tires and wheels, statistically, one in every 10 serious accidents is a fatality. That's 100 times more often than in most other industries.



1 in 10
TIRE SERVICE INDUSTRY

2 Specifications

Alcoa aluminum disc wheel mounting dimensions are consistent with SAE Recommended Practice J694 February 2001. Part numbers listed for all sizes are satin finish (the last digit of the six-digit numerical part number is "0"). Polished finishes are indicated by changing the last digit of the part number listed to one of the following: For polished outside only, part number should end in "1." For polished inside only, part number should end in "2." For polished both sides, part number should end in "3." Only for item numbers marked with a single asterisk (*), part numbers ending in "9" are inset position wheels satin finished (see footnote).
Dura-Bright® surface treated wheels are identified by using the regular numerical part number and the addition of "DB" at the end. Finishes are indicated by changing the last numerical digit of the part number to one of the following. For brushed both sides, the number is "0." For buffed outside only, the number is "1." For buffed inside only, the number is "2." For buffed both sides, the number is "3." Only the wheel part numbers with available surface finishes having the "DB" suffix are available with the Dura-Bright® option. Dura-Flange® wheels are identified by using the regular numerical part number and the addition of "DF" at the end. Only the wheel part numbers with available surface finishes having the "DF" suffix are available with the Dura-Flange® option.

Note: The Dura-Bright® surface treatment and the Dura-Flange® options are not currently available together on the same wheel.

TUBELESS WHEELS (round hand holes) ENGLISH UNITS

Item no.	Wheel description	Maximum wheel load[1] in lbs.	Wheel wt. lbs.	Outset inches[3]	Inset inches	Maximum inflation PSI—cold	Valve stem	Part number[2]	Available Finishes[4]	Stabilizer	Front outer cap nuts	Rear outer cap nuts
Six-hole, stud located, ball seat mounting—8.750 in. bolt circle, 6.495 in. hub bore, 1.219 in. bolt hole diameter ***DiscMate™:*** *N/A* ***Lug nut covers:*** *150* ***Hub covers:*** *N/A* ***Rear inner cap nuts Al/Al:*** *5988 L&R* ***Rear inner cap nuts Al/Stl:*** *7896 L&R*												
1	17.5x6.75-15°DC	5070	32	5.55	4.72	125	TR543C	**663170**	**0, 2**	2125	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	5996 L&R
10-hole, stud located, ball seat mounting—8.750 in. bolt circle, 6.495 in. hub bore, 1.219 in. bolt hole diameter ***DiscMate™:*** *N/A* ***Lug nut covers:*** *150* ***Hub covers:*** *NA* ***Rear inner cap nuts Al/Al:*** *5988 L&R* ***Rear inner cap nuts Al/Stl:*** *7896 L&R*												
2	17.5x6.75-15°DC	5070	31	5.55	4.72	125	TR543C	**663070**	**0, 2**	2125	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	5996 L&R
10-hole, stud located, ball seat mounting—11.25 in. bolt circle, 8.73 in. hub bore, 1.219 in. bolt hole diameter ***DiscMate™:*** *3/4" - 016000, 1-1/8" 017000* ***Lug nut covers:*** *150* ***Hub covers:*** *Front - 076015, Hub Covers Rear - 077015* ***Rear inner cap nuts for wheel P/Ns 883110, 893000, and 983120 only: Al/Al:*** *5988 L&R* ***Al/Stl:*** *7896 L&R* ***All other wheel P/Ns:*** *N/A*												
3	22.5x8.25-15°DC	7200	53	6.66	5.68	120	TR545D	**883110**	**0, 1, 2, 0DB, 1DB, 2DB**	2225	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
4	22.5x9.00-15°DC	9000	60	6.94	5.94	130	TR543C	**893000**	**0, 1, 2**	2127	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
5	22.5x12.25-15°DC	11,400	62	.56 Reversible	—	130	TR543E	**823000**	**0, 2**	-	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
*6	22.5x12.25-15°DC	11,400	66	3.88	2.76	130	TR543E outset TR545E inset	**823050**	**0, 1, 2, 9**	-	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
7	22.5x12.25-15°DC	11,000	70	5.84	4.68	130	TR545E	**823060A**	**0, 1**	-	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
††8	22.5x14.00-15°DC	12,800	71	2.0	—	130	TR543E outset	**841100**	**0, 2**	-	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
9	24.5x8.25-15°DC	7200	59	6.6	5.59	120	TR545D	**983120**	**0, 1, 2**	-	3/4" Stud 5995 L&R, 1-1/8" Stud 5996 L&R	
Eight-hole, hub piloted mounting—275mm bolt circle, 221.1mm hub bore, 26.75mm bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *014000* ***Lug nut covers:*** *181* ***Hub covers:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
10	22.5x7.50-15°DC	7300	53	6.28	5.44	120	TR545D	**873400**	**0, 1, 2, 0DB, 1DB, 2DB**	2225	39874	
11	22.5x8.25-15°DC	7400	50	6.66	5.82	130	TR544D	**883440**	**0, 1, 2, 0DF, 1DF, 2DF**	8864	39874	
††12	22.5x14.00-15°DC	12,800	71	2.0	—	130	TR543E outset	**841400**	**0, 2**	-	39874	
13	24.5x8.25-15°DC	7300	62	6.6	5.77	120	TR509	**983400**	**0, 1, 2**	2245	39874	

Continued on the next page.

TUBELESS WHEELS (round hand holes) ENGLISH UNITS — *continued*

Item no.	Wheel description	Maximum wheel load[1] in lbs.	Wheel wt. lbs.	Outset inches[3]	Inset inches	Maximum inflation PSI—cold	Valve stem	Part number[2]	Available Finishes[4]	Stabilizer	Front outer cap nuts	Rear outer cap nuts
10-hole, hub piloted mounting—285.75mm bolt circle, 220.1mm hub bore, 26.75mm bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *011000* ***Lug nut covers:*** *181* ***Hub covers:*** *Front - 076018 or 076085‡ Rear - 077018 or 077085‡* ***Rear inner cap nuts:*** *N/A*												
14	22.5x7.50-15°DC	7300	53	6.28	5.44	120	TR545D	**873600**	**0, 1, 2, 3, 0DB, 1DB, 2DB, 3DB**	2225	39874	
15	22.5x8.25-15°DC	7400	48	6.66	5.81	130	TR544D	**883640**	**0, 1, 2, 3, 0DB, 1DB, 2DB, 3DB, 0DF, 1DF, 2DF,**	8864	39874	
§16	22.5x8.25-15°DC	8000	55	6.66	5.69	130	TR543C	**885600**	**0, 1, 2, 0DF, 1DF, 2DF**	-	39874	
17	22.5x9.00-15°DC	9000	60	6.94	6.04	130	TR544D	**893640**	**0, 1, 2, 3, 0DB, 1DB, 2DB, 3DB**	8964	39874	
18	22.5x9.00-15°DC	10,000	53	—	3.12	130	TR545E	**893630**	**0, 1, 0DB, 1DB**	-	39874	
**19	22.5x10.50-15°DC	10,500	68	6.61	5.5	130	TR543	**803600**	**0, 1, 0DB, 1DB**	-	39874	-
20	22.5x12.25-15°DC	12,300	63	.56 Reversible	—	130	TR543E	**823600**	**0, 2**	-	39874	
*21	22.5x12.25-15°DC	11,400	66	3.88	2.75	130	TR543E outset TR545E inset	**823650**	**0, 1, 2, 0DB, 1DB, 2DB, 0DF, 1DF, 2DF, 9, 9DB, 9DF**	-	39874	
22	22.5x12.25-15°DC	11,000	71	5.8	4.68	130	TR542	**823640**	**0, 1, 0DB, 1DB, 0DF, 1DF**	-	39874	
*23	22.5x13.00-15°DC	12,300	73	3.5	2.38	130	TR543E outset TR545E inset	**833650**	**0, 1, 2, 9**	-	39874	
24	22.5x13.00-15°DC	11,000	74	6.42	5.3	130	TR542	**833640**	**0, 1**	-	39874	
††25	22.5x14.00-15°DC	12,800	71	2.0	—	130	TR543E outset	**841600**	**0, 2, 0DB, 1DB, 2DB**	-	39874	
††26	22.5x14.00-15°DC	12,800	71	1.13	0	130	TR545E outset TR543E inset	**841610**	**0, 1, 2, 9, 0DB, 1DB, 2DB, 9DB**	-	39874	
27	24.5x8.25-15°DC	7400	56	6.6	5.73	130	TR545D	**983640**	**0, 1, 2, 3, 0DB, 1DB, 2DB, 3DB, 0DF, 1DF, 2DF, 3DF**	8864	39874	
§28	24.5x8.25-15°DC	8000	65	6.6	5.63	130	TR545D	**985600**	**0, 1, 2, 0DF, 1DF, 2DF**	-	39874	
10-hole, hub piloted bus mounting—11.25 in. bolt circle, 8.670 in. hub bore, 1.219 in. bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *015000* ***Lug nut cover:*** *182* ***Hub covers:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
29	22.5x8.25-15°DC	7300	53	6.66	5.82	120	TR545D	**883610**	**0, 3, 0DB, 3DB, 0DF, 3DF**	-	-	-
**30	24.5x8.25-15°DC	7300	62	6.6	5.77	120	TR545D	**983610**	**0, 3, 0DB, 3DB**	2245	-	-

TUBELESS WHEELS (round hand holes) ENGLISH UNITS (METRIC UNITS)

Item no.	Wheel description	Maximum wheel load[1] in lbs. (kg)	Wheel wt. lbs. (kg)	Outset inches[3] (mm)	Inset inches (mm)	Maximum inflation PSI—cold (KPa)	Valve stem	Part number[2]	Available Finishes[4]	Stabilizer	Front outer cap nuts	Rear outer cap nuts
Eight-hole, hub piloted mounting—275mm bolt circle, 221.1mm hub bore, 24.75mm bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *014000* ***Lug nut covers:*** *181* ***Hub covers:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
31	17.5x6.75-15°DC	5515 (2500)	29.5 (13.4)	5.55 (141)	4.72 (120)	142 (978)	TR543C	**663470**	**0, 2**	2125	39874	
32	19.5x6.75RW-15°DC	5515 (2500)	37.0 (16.8)	5.55 (141)	4.72 (120)	142 (978)	TR543C	**764490**	**0, 1, 2, 3**	2126	39874	
33	19.5x7.50RW-15°DC	6615 (3000)	37.7 (17.1)	6.10 (155)	5.28 (134)	142 (978)	TR543C	**773400**	**0, 1, 2, 3**	2126	39874	

Continued on the next page.

TUBELESS WHEELS (round hand holes) ENGLISH UNITS (METRIC UNITS) — *continued*

Item no.	Wheel description	Maximum wheel load[1] in lbs. (kg)	Wheel wt. lbs. (kg)	Outset inches[3] (mm)	Inset inches (mm)	Maximum inflation PSI—cold (KPa)	Valve stem	Part number[2]	Available Finishes[4]	Stabilizer	Front outer cap nuts	Rear outer cap nuts
10-hole, hub piloted mounting—225mm bolt circle, 176.1mm hub bore, 26.50mm bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *N/A* ***Lug nut covers:*** *181* ***Hub covers:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
34	17.5x6.00-15°DC	5515 (2500)	28.0 (12.7)	5.24 (133)	4.49 (114)	142 (976)	TR543D	**663200**	**0, 1, 2**	2125	39874	
10-hole, hub piloted mounting—285.75mm bolt circle, 220.1mm hub bore, 26.75mm bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *011000* ***Lug nut covers:*** *181* ***Hub covers:*** *Front - 076018 or 076085‡ Rear - 077018 or 077085‡* ***Rear inner cap nuts:*** *N/A*												
35	19.5x7.50RW-15°DC	6615 (3000)	37.7 (17.1)	6.10 (155)	5.28 (134)	142 (978)	TR543C	**773600**	**0, 1, 2, 3**	2126	39874	
10-hole, hub piloted mounting—335mm bolt circle, 281.2mm hub bore, 26.75mm bolt hole diameter (use two-piece flange nuts) ***DiscMate™:*** *013000* ***Lug nut covers:*** *181* ***Hub covers for P/N 833580 only:*** *5811 polished with view port* ***All other P/Ns:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
†36	22.5x8.25-15°DC	8047 (3650)	52.0 (23.6)	6.57 (167)	5.70 (145)	138 (952)	70MS7	**886520**	**0, 3, 0DB, 3DB**	-	39874	
†37	22.5x9.00-15°DC	9094 (4125)	54.2 (24.6)	6.89 (175)	6.02 (153)	142 (978)	70MS7	**896520**	**0, 3, 0DB, 3DB**	-	39874	
‡‡38	22.5x13.00-15°DC	12,800 (5806)	76.0 (34.5)	—	6.12 (155)	130 (896)	TR543	**833580**	**0, 1**	-	39874	
39	24.5x8.25-15°DC	8500 (3855)	62.6 (28.4)	6.79 (172.5)	5.81 (147.5)	120 (827)	TR544D	**983500**	**0, 3**	-	39874	
10-hole, hub piloted mounting—335mm bolt circle, 281.2mm hub bore, 32.87mm bolt hole diameter (use two-piece sleeved cap nuts) ***DiscMate™:*** *018000* ***Lug nut covers:*** *N/A* ***Hub covers:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
†40	22.5x8.25-15°DC (32mm bolt hole)	8047 (3650)	52.0 (23.6)	6.57 (167)	5.70 (145)	138 (952)	70MS7	**886510**	**0, 3, 0DB, 3DB**	-	4306.32	4307.32
†41	22.5x9.00-15°DC (32mm bolt hole)	9094 (4125)	54.2 (24.6)	6.89 (175)	6.02 (153)	142 (978)	70MS7	**896510**	**0, 3, 0DB, 3DB**	-	4306.32	4307.32
Six-hole, hub piloted mounting—205mm bolt circle, 160.2mm hub bore, 21.5mm bolt hole dia. (use two-piece flange nuts) ***DiscMate™:*** *N/A* ***Lug nut covers:*** *N/A* ***Hub covers:*** *N/A* ***Rear inner cap nuts:*** *N/A*												
42	17.5x6.00-15°DC	4000 (1814)	29.6 (13.4)	5.0 (127)	4.25 (108)	110 (758)	60MS27	**664220**	**0, 1**	-	-	-

Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating. Do not overinflate. Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire, perform a wheel fitment check to ensure proper clearance from any obstructions.

[1]Capacity ratings as dual or single in highway service — bias-ply or radial. Load ratings in lbs. for items 31 through 42 rounded to nearest multiple of 5.

[2]Part numbers listed for all sizes are satin finish (the last digit of the six-digit numerical part number is "0"). Polished finishes are indicated by changing the "0" with any of the suffixes in the adjacent column (Available Finishes). Some wheels may bear part numbers not shown in this manual. Before servicing these wheels, contact your Alcoa wheel representative for proper load, inflation and part compatibility information.

[3]Outset (positive)/inset (negative) — The distance from the rim centerline to the mounting face of the wheel. Inset (negative) places the rim centerline inboard of the wheel mounting face and outset (positive) places the rim centerline outboard of the wheel mounting face (½ dual spacing = offset).

[4]The Dura-Bright® surface treatment and the Dura-Flange® options are not currently available together on the same wheel.

* Part numbers should end in "1" or "9" when used in an inset position and "0" or "2" when used in an outset position.

† Indicates European New Generation Wheels.

†† Check with vehicle manufacturer or axle manufacturer before retrofitting to outset wide base wheels to insure compatibility with axle and wheel end components. P/Ns 841100, 841400, and 841600 are not recommended for use on "N" spindle trailer axles.

‡ Hub cover system kits P/N 076085 (front) and P/N 077085 (rear) contain screw-on Hug-A-Lug® cap nut covers and require a minimum of four threads of the stud to extend above the tightened cap nut for use.

‡‡ The minimum stud standout required for P/N 833580 is 2.375 inches (60.3mm) when using wheel nut P/N 39874. Taller nuts will require more stud standout.

§ P/Ns 885600 and 985600 are Alcoa Severe Service™ Wheels.

** Effective April 1, 2007, the DB Finish Option will fall under the Non-Stock Policy.

Note: Dura-Bright® wheels produced after November 2002 have Alcoa wheel part numbers ending with "DB" (earlier wheels have part numbers ending in a 4 or 7) with bead seat diameters measured in 0.5-inch increments.

Specifications are subject to change without notice. To request a copy of the current Alcoa Specifications Data brochure for aluminum wheels for trucks, trailers and buses, call toll-free 800-242-9898, option 1. To view online, go to www.alcoawheels.com. The Spec Data brochure contains current part number availability and complete specifications such as wheel dimensions, load rating, wheel weight, outset and inset, inflation pressure and accessory part numbers.

Alcoa provides training, live or on video, on proper wheel installation and maintenance practices free of charge. Contact Alcoa Wheel and Forged Products at 1-800-242-9898, option 4.

Note: Dura-Bright® wheels produced after November 2002 have Alcoa wheel part numbers ending with "DB" (earlier wheels have part numbers ending in a 4 or 7). Not all Alcoa wheels are available with the Dura-Bright® surface treatment.

Note: The Dura-Bright® surface treatment and the Dura-Flange® options are not currently available together on the same wheel. Dura-Bright® is available in all polishing finishes, Dura-Flange® is only available in satin finish.

3 Inspection

Inspect thoroughly and frequently

3-1

Safe operation requires thorough examination of wheels and attaching hardware, at frequent intervals, both on and off the vehicle.

Wheels that have been in service need to be inspected at regular intervals to assure proper and safe performance.

It isn't always possible to predict exactly when the useful life of a wheel will end. Wheels will eventually wear out. But generally, older wheels and wheels operating in extreme conditions should be examined more frequently for obvious signs that they should be removed from service.

Examine all exposed areas frequently. Clean wheels and look for cracks or other damage. Also check the inner dualed wheel when the outer wheel is removed.

During tire changes, thoroughly examine the entire wheel. Pay particular attention to the rim contour and the surfaces of the rim.

Hidden damage

Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Do not overinflate. Use the tire manufacturer's recommended pressure, but under no circumstances exceed cold tire pressures listed in Section 2 Specifications of this manual. Before mounting the tire, perform a wheel fitment check to insure proper clearance from any obstructions.

Some forms of wheel damage can be hidden beneath the tire, so whenever a tire is removed, thoroughly examine the complete wheel. Remove all grease and road dirt. Use a wire brush or steel wool to remove rubber from the bead seats.

Check mounting holes for the enlargement and elongation which can occur if the cap nuts are not kept tight (see Section 3-8). Dirt streaks radiating from stud holes may indicate loose cap nuts.

Wheel alteration

3-2

Alcoa does not approve any form of alteration to wheels except minor cosmetic buffing for appearance purposes or sanding in the rim flange area (see Section 3-12).

Wheels should not be altered by welding, brazing or other heat application in an attempt to repair or straighten a wheel. Use of adapter plates or bead-locks are not approved on Alcoa wheels.

Wheels should not be painted or otherwise coated in any way that may interfere with the mounting surfaces.

Any wheel that show signs of alteration should be removed from service and scrapped.

WARNING Welding, brazing or otherwise heating any area of an Alcoa aluminum wheel will weaken the wheel. Weakened or damaged wheels can lead to an explosive separation of tires and wheels or wheel failure on the vehicle.

WARNING Explosive separations of tires and wheels or wheel failure on the vehicle could cause injuries or death.

Never attempt to weld, braze or heat any surface of an Alcoa aluminum wheel.

Excessive heat damage

3-3

WARNING

WARNING Excessive heat from fire, brake malfunction, wheel bearing failure or other sources may weaken the metal and cause the wheel/tire assembly to separate explosively.

Exploding wheel/tire assembly can cause death or serious injury.

Immediately and permanently remove from service any wheel that has been exposed to excessive heat.

Inspect for exposure to excessive heat. A wheel that has been subjected to excessive heat may appear charred or burned. A wheel that has been exposed to excessive heat may appear to be in good condition if it has been cleaned. Do not use any wheel that has been overheated regardless of appearance. Even if a wheel does not appear to be obviously burned, check the valve hole, labels, tire bead, brake drum and DiscMate™ for evidence of charring, melting, blistering or burning.

A wheel may discolor from excessive heat. It can appear a dull grayish color and will not polish to a bright finish as a typical wheel would.

Any wheel run with a flat tire longer than the time necessary to immediately pull off the road should be checked for excessive heat damage.

A blistered, charred, blackened or cracked-looking logo decal on an Alcoa wheel may indicate that the wheel has been exposed to excessive heat.

Inspect all axle end components for signs of exposure to excessive heat. Pay particular attention to brake drums (or discs), DiscMate™ wheel liners and tire beads. If these components show signs of over heating, the entire assembly, including the wheel, should be replaced.

3

Dimension checks

3-4

Open side circumference check

WARNING

WARNING Wheels that have been subjected to high pressure tire and rim separation, run flat, excessive heat or other physical damage may no longer have sufficient dimension and contour to retain tire bead while under pressure.

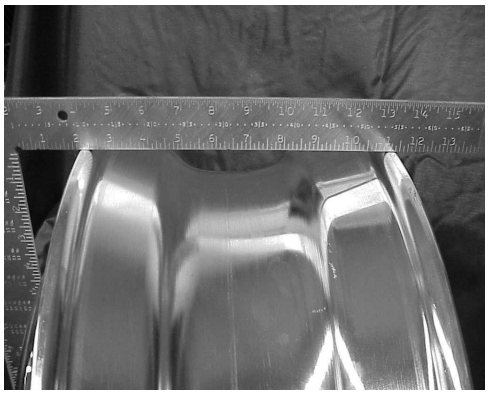
Rims that lack proper dimension and contour can lead to explosive separation of tire and rim, causing injury or death.

Follow dimension check procedures described in this section during each wheel inspection.

3

Photo #1 shows the carpenter's square even on both bead seats.

Photo #2 shows an undersized wheel that you can clearly place a .020 card between the square and the wheel.



Check all wheels at each tire change for proper contour of the open side of the rim. Place the long leg of a carpenter's square across the center of the disc side of the wheel. Extend the short leg across both rim flanges of the wheel as shown above. Repeat this process at four equidistant points around the wheel.

The short leg should touch both rim flanges at each point. If a distance greater than the thickness of a credit card appears between the short leg and the rim flange, the wheel should be removed from service and scrapped.

The circumference of the bead seat on the open side of the wheel should be checked with each tire change. The open side is the side opposite the disc face. In the case of center flange wide base wheels, or wheels with insets less than 3 inches, both rim flanges should be checked. Measure the circumference of the bead seat on the open side (see illustration below) with a ball tape. Ball tapes used for measuring wheel circumference can be purchased from the Tire and Rim Association, Inc., 175 Montrose West Avenue, Copley, Ohio 44321. (330) 666-8121 or at www.us-tra.org.

If the circumference of the bead seat does not match the required dimension as indicated by the ball tape, remove the wheel from service.

Any wheel known to have been run with a flat tire or operated under abnormal conditions should be checked before continued service. If a ball tape is unavailable, roll the unmounted wheel without a tire several revolutions over a smooth, flat, level, clean surface. Any deviation from rolling in a straight line is an indication of a potential lack of proper dimension and contour. Remove the wheel from service until it can be properly checked with a ball tape.

Continued on the next page

Dimension checks (continued)

Tire wear or ride problems

If you experience tire wear or ride problems it may be helpful to check radial run out. Remove the wheel from the vehicle, deflate and remove the tire (see Section 4-5, for recommendations and instructions for demounting tubeless tires).

Remount the wheel on the vehicle without the tire. Be sure to follow proper mounting procedures to assure the wheel is well centered on the hub. Place a dial indicator as illustrated below to trace the bead seats of the wheel. Rotate the wheel noting the amount of variation shown on the dial indicator. Note: Alcoa aluminum wheels should be tested for radial run out only at the bead seat surface. A total indicator reading of .040 inches is acceptable.

Tire wear can also be caused by improperly seated tires. Inspect the tire for proper seating on the wheel. The tire beads may not be seated properly. If so, remove the wheel from the vehicle, deflate and break the bead seats (see Section 4-5 for recommendations and instructions for demounting tubeless tires). Adequately lubricate the bead seats and properly reseat the tire beads. Reinflate the wheel in a safety cage or other suitable restraint (refer to OSHA rule 1910.177, paragraph b, see Section 7).

Cracked or damaged wheel checks

WARNING

WARNING Cracked or damaged wheels may cause wheels to fail or come off the vehicle while the vehicle is moving.

Wheels that fail or come off the vehicle while it is moving can cause serious injury or death.

Immediately remove cracked or damaged wheels from service.

Visually inspect wheels for cracks or damage according to Section 3, Inspection and Maintenance. Remove wheels from service with known or suspected damage.

Mounting area

3-6

Stud hole cracks are usually caused by improper torquing (see Sections 5-8, and 6-2), excessive loading or insufficient mounting flange support by the hub or brake drum. Remove wheel from service.

Shown below are stud hole cracks emanating from stud hole to stud hole. Causes are: undersized diameter of wheel support surface (see specifications on next page), support surface not flat, incorrect attachment parts (see Section 4-12) and insufficient torque (see Sections 5-8, 5-11, 6-2). Remove wheel from service.

Support surface should be flat to the diameter recommended on the chart on the following page.

Inspect the hub/drum contact area thoroughly for cracks or other damage.

Mounting area (continued)

Support surface diameters

Support surface should be flat to the diameter recommended on the chart below:

Number of Bolts	Bolt Circle	Mounting Type	Backup Diameter	Thread Size
10	11.25 inch	U.S. Stud pilot	13.2-13.5 in.	.750/1.125 in.
10	285.75mm	Hub pilot	13.2-13.4 in.	22mm
10	335mm	Hub pilot	15.0-15.2 in.	22mm
8	275mm	U.S. Stud pilot	13.2-13.5 in.	22mm
8	275mm	ISO Hub pilot	12.4-12.6 in.	20mm

Corrosion

Certain environments can lead to corrosion. Some of these are: salt, magnesium chloride and calcium chloride compounds used for snow removal and highly alkaline materials. If the air used to fill tubeless tires, or the tire itself, is not dry, the areas of the wheel under the tire can corrode severely.

3-7

Bead seat and valve stem corrosion are often caused by entrapped moisture. Mild corrosion should be removed thoroughly by wire brush and the rim protected with non-water-based tire lubricant (see Section 4-1). Remove any severely corroded wheel from service.

Hub bore with severe corrosion. Remove any severely corroded wheel from service

Hub bore gauge with severe corrosion. Remove any severely corroded wheel from service

CAUTION

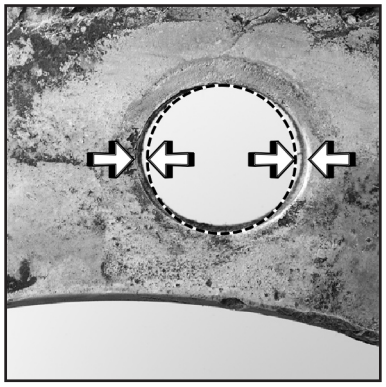
CAUTION The use of liquid tire balancers or sealants in Alcoa wheels may cause extremely rapid corrosion of the wheel rim surface.

Severely corroded wheels are unsuitable for service. Alcoa wheels corroded by the use of liquid tire balancers or sealants will not be replaced under the Alcoa limited warranty.

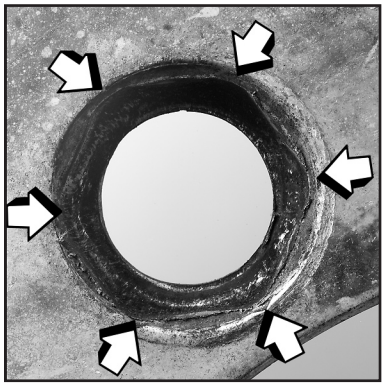
Stud holes

3-8

If wheels are run loose, both stud located wheels and hub piloted wheels can be damaged. Look for wallowed out or elongated ball seats on stud located wheels. On hub piloted wheels look for elongated stud holes. Over torquing can lead to damaged ball seats on stud located wheels and can damage the disc surface of hub piloted wheels. Remove damaged wheels from service.



Damaged hub piloted bolt hole. Elongation from true round (dashed circle) indicated by arrows.



Damaged ball seat contact area. Pounding of nut on ball seat contact area identified by arrows.

Disc area

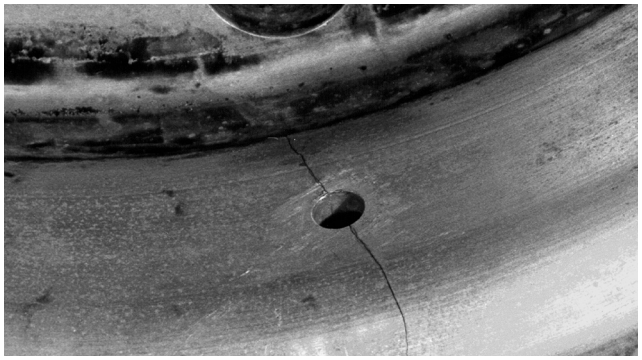
3-9

Inspect both sides of disc area for hand hole cracks. If cracks are found, remove the wheel from service.

Rim area

Check the entire rim area for nicks, gouges and cracks. Loss of air may be caused by cracks in areas around the valve stem hole. Remove the wheel from service.

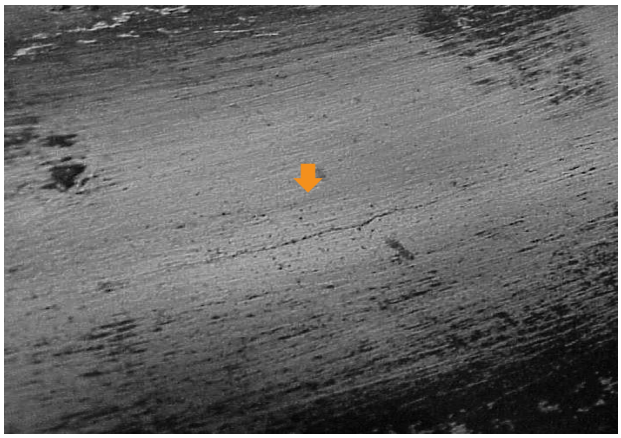
3-10



Bead seat cracks

Loss of air may be caused by cracks in the bead seat areas around the rim. Remove the wheel from service if damaged.

3-11



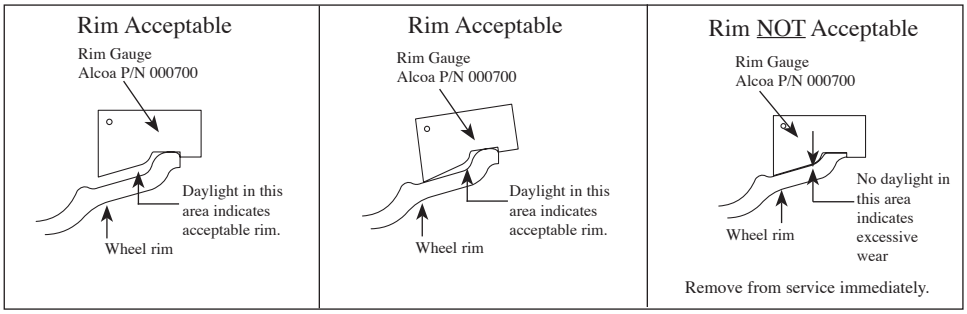
Bead seat cracks are normally caused by overloading of the wheels. If you have this type of wheel breakage it would be recommended to look into severe service wheels.

Rim flange wear

3-12

Irregular wear on the surface of the rim flange is caused by abrasion from the tire chafer and sidewall. Rim flange wear happens most often in applications with heavy or shifting loads. If you are experiencing excessive rim flange wear in your operation, consider using Alcoa Dura-Flange® aluminum wheels. These wheels have been specially treated to significantly reduce rim flange wear. Remove wheels from service when rim flange wear is excessive. Excessive wear can be determined using an Alcoa approved wear gauge and procedures detailed below. If rim flange wear becomes sharp and/or cuts the tire, contact Alcoa for recommended maintenance procedures.

Alcoa Rim Flange Wear Gauge Instructions



To obtain a gauge(s) at no charge and information on free training on proper installation and maintenance procedures, contact Alcoa Wheel Products at (800) 242-9898 option 1 or on the web at www.alcoawheels.com.

Determining Rim Flange Wear

STEP 1. Remove the wheel/tire assembly from the vehicle. Remove the valve core to deflate the tire completely. Remove the tire from the wheel according to OSHA regulations, TMC recommended practices for tire and rim safety procedures and/or the Alcoa Wheel Service Manual.

Photo 1. Acceptable Rim Flange Wear Condition

Rim flange wear (continued)

STEP 2. After the wheel is separated from the tire, use a ball tape to verify the circumference of the bead seat on the open side is acceptable (see Section 3-4). Check the wheel flange with the Alcoa Rim Flange Wear Gauge to determine if the wheels must be removed from service for excessive rim flange wear (photo 1 on previous page).

See Rim Flange Wear Gauge Instructions illustrations on previous page to make this determination. If you do not have an Alcoa Rim Flange Wear Gauge, contact Alcoa Wheel Products to obtain a gauge(s) at no charge by calling (800) 242-9898 option 1 or on the web at www.alcoawheels.com.

STEP 3. If the wheel is deemed to be serviceable by the rim flange gauge, examine the wheel flange edge for sharpness by using a rubber sharpness gauge. These gauges are constructed by having a section of tire side wall or a suitable piece of rubber attached to a block of wood (photo 2). By running the sharpness indicator gauge along the wheel in the area of the wear, determine if the wear is sharp enough to cut or damage the rubber on the sharpness indicator (photo 3). If the rubber is cut, then follow the edge removal instructions below.

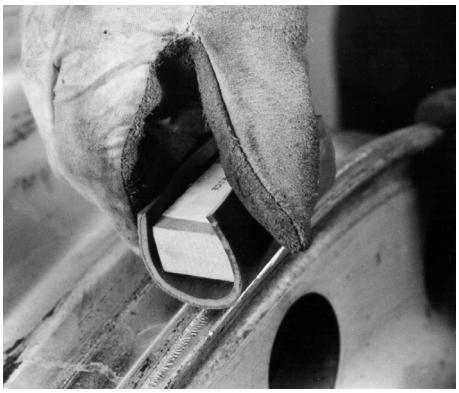


Photo 2. A rubber sharpness gauge constructed from a section of tire side wall or a suitable piece of rubber attached to a block of wood.

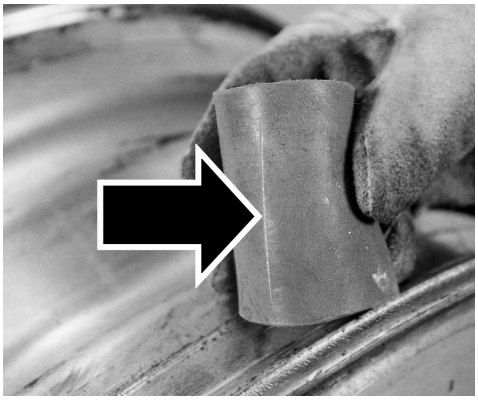


Photo 3. Run the sharpness indicator gauge along the wheel in the area of the wear to determine if the wear is sharp enough to cut or damage the rubber on the sharpness indicator.

NOTICE: Examine the tire for cuts in the bead area and side wall. If no damage occurred to these areas, return the tire to service. Cut tires should be removed from service. The tire should be inspected at this time for any other damage and be treated per normal tire procedures recommended by the tire manufacturer.

NOTICE: Check the wheel at every tire change or ONCE PER YEAR for rim flange wear and any sharp edges. If you follow this practice, you will significantly reduce the possibility of a rim flange cutting into the tire.

If the flange cuts or appears close to being sharp enough to cut the rubber on the sharpness indicator gauge, the edge can be removed per the edge removal procedures below. If the rubber is not cut, then the wheel can be returned to service without further work for rim flange wear.

CAUTION

CAUTION Do not run unprotected hands or fingers across worn rim flange areas of used wheels.

Worn rim flange areas are sharp and can cut hands or fingers. Cuts can lead to infection.

Always wear gloves when handling used wheels or when testing for edge sharpness.

Rim flange wear (continued)

Edge Removal Procedures

There are many tools available to remove the sharp edge on the wheel caused by rim flange wear. Here are some examples of commonly used tools:

File. A file can be used very effectively to remove the edge (photo 4).

Photo 4. Removing sharp edge by hand with a metal file.

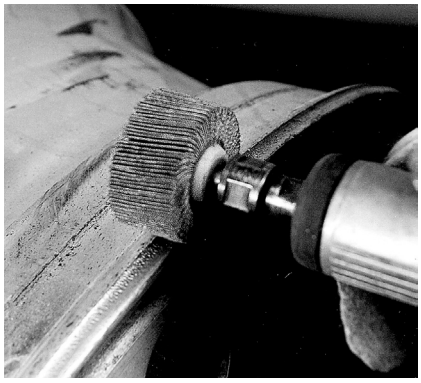


Photo 5. Air or electric powered sander.

Air or Electric Powered Sander. This provides a very quick and effective method of removing the edge. Operators should use all care to keep a uniform edge when using these tools (photo 5).

Air or Electric Grinder. Another quick and effective method of removing the sharp edge caused by rim flange wear. Be careful as grinding pads may "gum up" from the aluminum that is removed (photo 6). Care must be used to avoid gouging the wheel.

Photo 6. Air or electric grinder

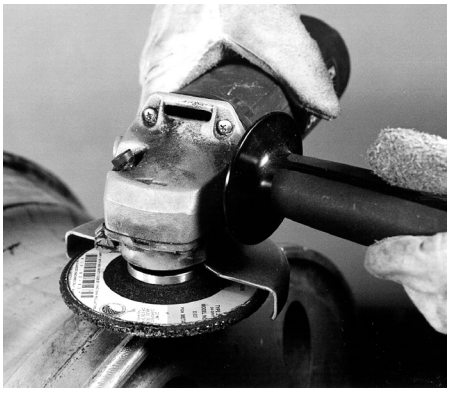


Photo 7. Die grinder.

Rim flange wear (continued)

Die Grinder. Used with a sanding wheel, cutting stone or grinding tool, this is a version of an electric grinder. This tool is very quick and effective as well, and care must be taken to remove metal as uniformly as possible and not to gouge the wheel (photo 7 on previous page).

CAUTION

CAUTION Removing sharp edges with hand or power tools produces metal filings and sparks. Many power tools have edges that are sharp or may become hot during use. Some power tools produce excessive noise when used.

Metal filings can be sharp and, when projected by the action of power tools, can cause serious skin or eye damage. Excessive noise from power tools can harm hearing. Sharp edges can produce cuts and hot surfaces can cause burns. Cuts and burns can lead to infection.

Always wear appropriate safety gear such as protective eyewear, gloves, protective clothing and hearing protection when using hand or power tools.

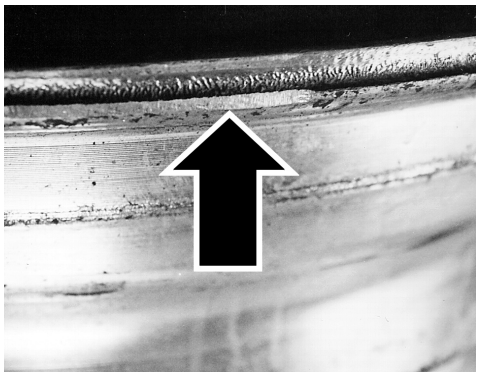


Photo 8. Adequate repair for sharp edge resulting from rim flange wear removes just enough metal to smooth the edge.

STEP 4. The photographs show the process of removing the edge. With whatever tool is selected, work the tool around the wheel's circumference removing only enough material to eliminate the sharp edge. This should only be a small amount of metal. Perform this work on both flanges if there is evidence of sharpness.

Regardless of the method that you choose, the objective is to remove the sharp edge (photo 8). Remove just enough metal to smooth the edge. Take care to make sure the edge removal is as uniform as possible. Avoid gouging the wheel.

Rim flange wear (continued)

STEP 5. After the edge is removed, run the sharpness indicator gauge along the area of edge removal to check for any remaining sharpness. If the rubber is still cut, perform the steps again to remove the sharp edge. Always remove the minimum amount of material necessary to eliminate the sharp edge.

STEP 6. Check the rim flange height with the Alcoa Rim Flange Wear gauge to make sure there is adequate height remaining to safely support the tire. The photograph again shows how this gauge is used (photo 1). Be sure to move the gauge all around the wheel's circumference and make sure that no area of the flange is below what the gauge indicates is acceptable. If the entire wheel flange is within the limits of the rim flange wear gauge, the wheel may be returned to service.

STEP 7. Always inspect the wheel for any other conditions that would warrant removal from service. Consult the Alcoa Wheel Service Manual or the TMC User's Guide to Wheels and Rims.

WARNING Welding or brazing the rim flange or any area of an Alcoa aluminum wheel will weaken the wheel. Weakened or damaged wheels can lead to an explosive separation of tires and wheels or wheel failure on the vehicle.

WARNING Explosive separations of tires and wheels or wheel failure on the vehicle could cause injuries or death.

Never attempt to weld or braze any surface of an Alcoa aluminum wheel.

WARNING Returning wheels to service with inadequate flange height as determined by the Alcoa Rim Flange Wear Gauge can lead to an explosive separation of tires and wheels.

Explosive separation can result in serious injury or death.

WARNING Wheels with flange height that falls below the Alcoa gauge have inadequate rim flange height to support the tire on the rim. Permanently remove any wheel from service that has inadequate rim flange height.

WARNING Excessive heat from fire, brake malfunction, wheel bearing failure or other sources may weaken the metal and cause the wheel/tire assembly to separate explosively.

Exploding wheel/tire assembly can cause death or serious injury.

WARNING Immediately and permanently remove from service any wheel that has been exposed to excessive heat.

Always follow safe mounting procedures as recommended using OSHA approved tire inflation cages. See the Alcoa Wheel Service Manual or OSHA safety wall charts and procedures.

Maintenance against corrosion (non-Dura-Bright® surface treated wheels)

3-13

The following information is for standard Alcoa forged aluminum wheels without the Dura-Bright® surface treatment. (See Section 3-14) for specific instructions on the care and cleaning of Alcoa Dura-Bright® surface treated wheels.

1. Clean frequently with high pressure water from a hose. The use of a mild detergent will speed the cleaning process. Use no harsh alkaline cleaners.

2. When tires are removed the entire wheel must be cleaned and inspected. (See Section 3). With a wire brush, remove any foreign products from the tire side of the rim. Do not use a wire brush to remove dirt and corrosion products from the appearance surface of the wheel. Generously coat the entire air chamber surface with an approved surface protectant and lubricant each time the tire is removed (see Section 4-1).

3. To maintain the original appearance of your Alcoa wheels, the following procedures are recommended:

a. After installing new wheels and prior to operating your vehicle, use a sponge, cloth or soft fiber brush to wash exposed wheel surfaces with a mild detergent and warm water solution.

b. Rinse thoroughly with clean water.

c. Wipe dry to avoid water spots.

d. Wax the cleaned surface with Alcoa Advanced Aluminum Care System Polish or any automotive polish equivalent.

e. Clean your Alcoa truck wheels as frequently as required to maintain their appearance.

Dura-Bright® surface treated wheels cleaning and maintenance

3-14

1. Clean frequently with high-pressure water. Use a mild detergent, rinse thoroughly with clean water and wipe dry to avoid water spots. Do not clean with abrasives, abrasive brushes, steel wool, scouring pads or strong chemicals such as acids or lye-based products. Never spray cold water on extremely hot wheels. Always allow time to cool before cleaning. DO NOT USE the Alcoa Aluminum Care System on Dura-Bright® wheels at any time during their service life.

2. When tires are removed, the entire rim must be cleaned and inspected (see Section 3). With a soft brush, remove any foreign products from the rim (portion of the wheel that supports the tire). Generously coat the entire air chamber surface with an approved surface protectant and lubricate each time the tire is removed (see Section 4-1).

3. Once in service, Dura-Bright® wheels can become nicked or scratched by road debris and/or mechanical damage. If this occurs, continue to follow the normal washing and cleaning instructions provided above. The surface of an Alcoa Dura-Bright® wheel is designed to limit cracking and peeling if nicked or scratched while in service.

4. Even as durable as Dura-Bright® wheels are, the mounting area can become scratched, marred or discolored when mounted against another wheel, hub or drum. The use of a wheel mounting surface guard, such as Alcoa DiscMate™, is highly recommended. The use of the Alcoa Hub Cover System on Alcoa Dura-Bright® wheels will also assist in limiting such damage and help maintain the appearance of your Alcoa Dura-Bright® wheels.

4 Alcoa 15° Drop Center Wheel for Tubeless Tires

Recommendations for mounting tubeless tires

4-1

NOTICE: For complete information on tube type wheels, contact Alcoa at (800) 242-9898 option 2.

WARNING Damaged tires or wheels can lead to an explosive separation of tires and wheels.

Explosive separation can result in serious injury or death.

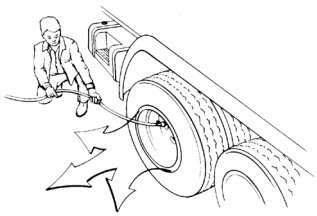
Inspect tires and wheels for damage before removing from vehicle. If damage is found, the tire must be completely deflated before loosening cap nuts. Remove damaged tires or wheels from service.

WARNING Use of inner tubes in tubeless wheels will hide slow leaks. Slow leaks may indicate cracked (see Section 2-9) or damaged wheels which lead to wheel failures.

Wheel failures can cause accidents which may result in serious injury or death.

Never use an inner tube on an Alcoa tubeless wheel, and always remove cracked or damaged wheels from service.

NOTICE: Alcoa aluminum nonsymmetrical wheels require special tire mounting techniques, see Section 4-3.



1. Do not gouge or nick the wheel. Place aluminum wheels on clean wooden floor or rubber mat when hand mounting tires. Additional care should be used when mounting Alcoa Dura-Bright® surface treated wheels since minor nicks and scratches cannot be polished out (see Section 3-14, pages 19 for specific cautions, care and maintenance procedures). DiscMate™ wheel spacers are recommended for use with Alcoa Dura-Bright® surface treated wheels to protect the wheel contact surfaces from marring.

2. Always use a rubber, leather-faced or plastic mallet.

3. Inspect the wheel for damage. Do not use a damaged or severely corroded wheel (see Section 3).

4. Clean the wheel face with mild detergent and the tire bead seat areas with a wire brush. Be sure the wheel is dry before applying tire lubricant.

5. Inspect the tire for damage. Be sure the inside of the tire is dry before it is mounted.

6. Use of a non-water-based lubricant is recommended as a rim surface protectant and tire mounting lubricant. Coat the entire rim surface (see Section 4-2).

7. Lubricate the rim and tire bead immediately before mounting the tire. Do not use any lubricant which contains water. Water-based lubricants can promote corrosion attack on the rim surface. The use of non-water-based lubricants is especially important when mounting tubeless tires as the air in the tire is contained by the seal between the bead and tire rim.

8. Never lubricate the rim or tire bead with a flammable solution. This can lead to an explosion during airing of the tire or in subsequent operation of the vehicle (see Warning on next page).

9. If using a tire mounting/demounting machine on aluminum wheels, care should be taken to prevent gouging the wheel.

10. Use only dry air for tire inflation. The use of moisture traps in the air compressor feed line is recommended.

11. Do not overinflate. Use the tire manufacturer's recommended pressure, but under no circumstances exceed cold tire pressures listed in Section 2 Specifications of this manual (see page 3).

12. When inflating a tire in an inflation cage or while mounted on a vehicle, always use a clip-on air chuck or threaded straight chuck and a remote valve with pressure gauge. Securely anchor the inflation cage and during inflation or handling of an inflated wheel and tire assembly, stay out of the path of potential exploding parts or air blasts.

Recommendations for mounting tubeless tires (continued)

WARNING

WARNING Use of a volatile or flammable material, such as ether or gasoline, as an aid to seating the tire beads on the wheel can lead to an uncontrolled pressure build-up in the tire and may result in an explosion.

Explosive separation of the tire and wheel can occur while seating beads in this manner, while adding air to the tire on or off the vehicle, or later on the road. Loss of vehicle control can result, which can cause serious injury or death.

Use only approved mechanical or pneumatic bead seating devices.

WARNING

WARNING A pressurized tire/wheel assembly can explode and separate violently.

This violent separation can cause serious injury or death.

Always contain the tire/wheel assembly in an inflation cage during inflation.

Mounting tubeless tires

4-2

NOTICE: Not all tire mounting/ demounting machines work alike. Be sure to read the operating or instruction manual for your particular machine before attempting to mount or demount tires.

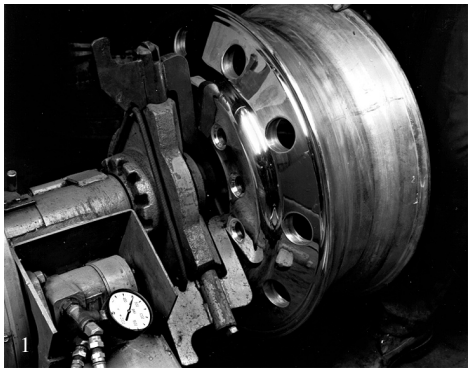
NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: When match mounting tires on Alcoa wheels locate valve stem adjacent to low point mark on the tire.

NOTICE: Alcoa aluminum 19.5" nonsymmetrical wheels require tires to be mounted and demounted over the disc side of the wheel only.

NOTICE: Refer to tire manufacturer's recommendation for proper tire pressure.



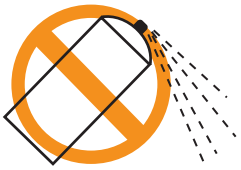
Position wheel on machine. Lubricate wheel (entire air chamber surface) and tire bead using approved lubricant. Tire beads should be mounted over the rim flange closest to the wheel well. Push bead over flange as far as possible.

Insert curved end of tool between bead and wheel flange with tool stop against flange. In circular motion, use short successive bites to work the bead over the flange. Push down on tool as bead is worked over flange.

Lubricate the second tire bead. Start second bead into the well, holding it in position with the clamp to the rim flange. Lubricate bead half way around. With curved end of tool between tire bead and flange, and the stop towards the wheel, push tool outward to work tire over flange. Continue to pry bead over flange using the tool until remaining bead is over flange. Seat the tire bead using an air ring or other mechanical bead seating aid.

Place tire/wheel assembly inside safety cage or other suitable restraint (refer to OSHA rule 1910.177, paragraph b, see Section 7). Refer to tire manufacturer's recommendation for proper tire pressure. Using a clip-on air chuck or a self-locking straight chuck with remote valve and pressure gauge, inflate the tire/wheel assembly to proper pressure. If air escapes, roll tire or use bead expander to force tire beads against rim. Be sure to stay out of the path of potential exploding parts or air blasts.

Mounting tubeless tires (continued)



NOTICE: Not all tire mounting/ demounting machines work alike. Be sure to read the operating or instruction manual for your particular machine before attempting to mount or demount tires.

NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: When match mounting tires on Alcoa wheels locate valve stem adjacent to low point mark on the tire.

NOTICE: Alcoa aluminum 19.5" RW nonsymmetrical wheels require tires to be mounted and demounted over the disc side of the wheel only.

NOTICE: Refer to tire manufacturer's recommendation for proper tire pressure.

WARNING

WARNING Use of a volatile or flammable material, such as ether or gasoline, as an aid to seating the tire beads on the wheel can lead to an uncontrolled pressure build-up in the tire and may result in an explosion.

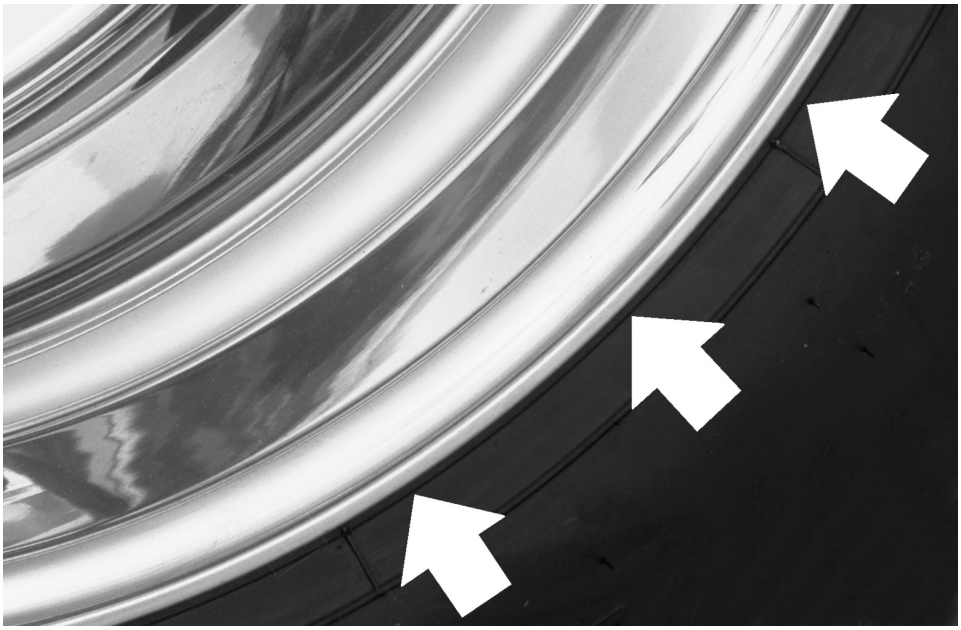
Explosive separation of the tire and wheel can occur while seating beads in this manner, while adding air to the tire or later on the road. Loss of vehicle control can result, which can cause serious injury or death.

Use only approved mechanical or pneumatic bead seating devices.

CAUTION

CAUTION The use of liquid tire balancers or sealants in Alcoa wheels may cause extremely rapid corrosion of the wheel rim surface.

Severely corroded wheels are unsuitable for service. Alcoa wheels corroded by the use of liquid tire balancers or sealants will not be replaced under the Alcoa limited warranty.



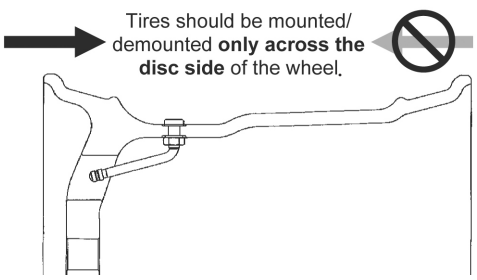
Heavy duty truck tires have a "guide rib" molded into the sidewall next to the tire bead. When the tire is inflated, this ring should be evenly spaced from the wheel rim all the way around the wheel. Check the position of the ring before removing the assembly from the inflation cage. If the ring and wheel are not concentric, deflate the assembly in the cage and remount the tire.

Mounting tires on reduced well wheels

Reduced well wheels feature an increased underwell diameter and also have a nonsymmetrical sloping rim profile which provides additional brake drum clearance.

Although tires can be fitted to these reduced well wheels from either side, mounting and particularly demounting is easier from the disc side of the wheel.

In order to minimize the possibility of bead damage, tires should be fitted to and removed from all Alcoa reduced well wheels only across the disc side of the wheel.



Rim width to tire matching

4-4

Rim width to tire matching chart for medium and heavy trucks.

Tire Size (for both radial and bias tires)		Approved Rim Widths	Tire Size (for both radial and bias tires)		Approved Rim Widths
8R	17.5HC	6.00HC	8	22.5	5.25, 6.00, 6.75
215/75R	17.5	6.00, 6.75	9	22.5	6.00, 6.75, 7.50
9R	17.5HC	6.75HC	10	22.5	6.75, 7.50, 8.25
10R	17.5HC	6.75HC, 7.50HC	245/75R	22.5	6.75, 7.50
245/75R	17.5	6.75, 7.50	11	22.5	7.50, 8.25
11R	17.5HC	8.25HC	255/70R	22.5	7.50, 8.25
			265/75R	22.5	7.50, 8.25
			12	22.5	8.25, 9.00
			295/75R	22.5	8.25, 9.00
			305/85R	22.5	8.25, 9.00
			315/80R	22.5	9.00, 9.75
			365/70R	22.5	10.5
			15	22.5	11.75, 12.25
			385/65R	22.5	11.75, 12.25
			425/65R	22.5	11.75, 12.25, 13.00
			16.5	22.5	12.25, 13.00
			18	22.5	13.00, 14.00
			445/50R	22.5	14.00
			445/55R	22.5	14.00
			445/65R	22.5	12.25, 13.00, 14.00
8	19.5	5.25, 6.00, 6.75	11	24.5	7.50, 8.25
225/70R	19.5	6.00, 6.00RW, 6.75, 6.75RW	275/80R	24.5	7.50, 8.25
			285/75R	24.5	8.25
245/70R	19.5	6.75, 6.75RW, 7.50, 7.50RW	12	24.5	8.25, 9.00
			305/75R	24.5	8.25, 9.00
265/70R	19.5	7.50, 7.50RW, 8.25, 8.25RW			
285/70R	19.5	8.25, 8.25RW, 9.00			
305/70R	19.5	8.25, 8.25RW, 9.00			
445/65R	19.5	13.00, 14.00			

There may be additional rim to tire matches not shown above. Contact the tire manufacturer or your Alcoa wheel representative for additional information.

Recommendations for demounting tubeless tires

4-5

WARNING An aluminum wheel can be structurally weakened by uncontrolled excessive heat.

Tire/wheel assemblies using wheels that have been exposed to excessive heat may experience a sudden and unpredictable tire/wheel separation causing serious injury or death.

Immediately and permanently remove any wheel from service that has been subjected to uncontrolled excessive heat (such as a tire fire, wheel bearing failure or braking system drag/seize) or a high pressure tire/wheel separation.

WARNING Damaged tires or wheels can lead to an explosive separation of tires and wheels.

Explosive separation can result in serious injury or death.

Inspect tires and wheels for damage before removing from vehicle. If damage is found, tire must be completely deflated before loosening cap nuts. Remove damaged tires or wheels from service.

Recommendations for demounting tubeless tires (continued)

1. When hand demounting tires from wheels, placing aluminum wheels on a clean wooden floor, or rubber mat is recommended. Additional care should be used when demounting Alcoa Dura-Bright® surface treated wheels since minor nicks and scratches can not be polished out (see Section 3-14, for specific cautions, care and maintenance procedures).

2 Always use a rubber, leather-faced or plastic mallet.

3. Keep tire tools smooth. Use them with care. Rim gouges or nicks may cause cracks.

4. If using a tire mounting/demounting machine on aluminum wheels, care should be taken to prevent gouging the wheel.

4

Demounting of tubeless tires

4-6

NOTICE: Not all tire mounting/ demounting machines work alike. Be sure to read the operating or instruction manual for your particular machine before attempting to mount or demount tires.

Remove the valve core from the valve stem to ensure complete deflation. Place wheel on machine and position tool so flat end can be driven between tire bead and rim flange. Straighten tool to a vertical position until bead is separated from wheel.

Repeat procedure at intervals until bead is totally separated from wheel. Repeat procedure on other side of tire. Tire is now ready for demounting. Lubricate the tire bead.

Insert curved end of tire tools between tire and wheel, approximately 10 inches apart. Pull one tool toward center of wheel, then pull second tool in the same manner. To free bead, leave one tool in position, take out and reinsert the other tool, curved end between bead and flange, a short distance from the spanned area. Pry bead free of rim, repeating process until entire bead is free from wheel.

Insert straight end of tire tool between beads and both rim flanges, hooking stop on the tool over second flange. Position inserted tool at 90° angle to tire assembly at top of wheel and lubricate bead areas on both sides of tool. Lean tire assembly toward tool and rock or bounce to pry off the tire.

5 Wheel Installation

Recommendations for proper installation of wheels

5-1

NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: Check for and replace bent, broken, cracked or damaged studs. When replacing broken studs, always replace the studs on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.

1. Make sure all wheel cap nuts are properly torqued — check them often (see Section 5-8). If the wheel is loose, the holes will pound out (deform). If some cap nuts are tight and others are loose, the wheel may develop cracks or studs may break. This condition may cause wheel to loosen and disengage from the vehicle. Dirt streaks radiating from stud holes can indicate loose nuts (see Section 3).

2. Be sure the end of the wheel wrench is smooth or cover the wheel mounting surface with a protective shield prior to tightening the cap nuts. The wrench end will mar the wheel around the cap nuts if it is not smooth.

3. Keep all component contact surfaces smooth and clean. Dirt or projections on mounting surfaces may lead to loose wheels. Remove all projections resulting from burrs, nicks, etc. Be sure that loose dirt does not fall onto mounting surface during assembly.

4. Do not introduce any foreign objects such as spacers or high hats into the contact surface areas of the mounting system unless approved by Alcoa. Do not paint Alcoa forged aluminum wheels.

5. Additional care should be used when mounting Alcoa Dura-Bright® surface treated wheels since minor nicks and scratches cannot be polished out (see Section 3-14 for specific cautions, care and maintenance procedures).

6. DiscMate™ is a protection gasket designed to be placed between the wheels and also the brake drum/wheel contact surfaces (see Sections 5-2, 5-6, 5-7, 5-9). DiscMate™ is recommended to be replaced when the tire/wheel assemblies are removed and reinstalled.

WARNING

WARNING Wheels that are not properly installed or maintained may not work properly.

Failure to follow proper wheel installation or maintenance practices may result in injury or death.

Follow the proper wheel installation and maintenance practices as contained in this Alcoa Wheel Service Manual. For training on proper installation and maintenance, available free of charge from Alcoa, or for the most recent updates, contact Alcoa Wheel Products at 1-800-242-9898 option 1 or on the web at www.alcoawheels.com.

Wheel cap nuts

5-2

WARNING

WARNING Use of chrome-plated cap nuts which have chrome plating on the surfaces which contact the wheel can cause reduced and inconsistent wheel clamping.

This condition can cause wheels to loosen and disengage from the vehicle, causing injury or death.

Never use cap nuts with chrome-plated contact surfaces. Use only recommended hardware on Alcoa aluminum wheels.

There are many types of nuts and studs in use, and their design and specifications are not standardized. The “R” and “L” on cap nut part numbers indicate right and left-hand threads respectively. Alcoa recommends the following cap nuts for use with Alcoa aluminum truck wheels:

Cap Nuts

NOTICE: One-piece flange nuts are not approved for use on any Alcoa wheel application.

2-piece 33mm hex head flange nut. Mounts single and dualed wheels to wheel centering hubs. Right-hand threads used on both sides of vehicle. Single wheels require 2" (50.8 mm) stud standout. Dualed wheels require 2-13/16 (71.44 mm) stud standout. P/N 39874 (supersedes P/Ns 39701 and 39691); M22-1.5 RH threads.

2-piece 30mm hex head flange nut. Mounts single and dualed wheels to wheel centering hubs. Right-hand threads used on both sides of vehicle. P/N 39708; M20x1.5 RH threads.

2-piece 33mm hex head flange nut. Mounts dualed wheels with 32mm bolt holes to wheel centering hubs. Right-hand threads used on both sides of vehicle. P/N 4307.32; M22x1.5 RH threads.

1-1/8" cap nut. Mounts standard single wheels and wide base wheels to 1-1/8" studs. Also mounts outer dualed wheel to 1-1/8" inner cap nut. P/N 5996R, 5996L (replaces P/N 5552R, 5552L).

3/4"x16 cap nut. Mounts Alcoa wide base wheels to 3/4" studs. Do not use on steel wheels. P/N 5995R, 5995L (replaces P/N 5554R, 5554L).

2 piece 1-1/16" hex head flange nut. Mounts single and dualed wheels to wheel centering hubs. Right-hand threads used on both sides of vehicle. P/N 39946; 5/8"x18 RH threads

2-piece 33mm hex head flange nut. Mounts single wheels to wheel centering hubs with 32mm bolt holes. Right-hand threads used on both sides of vehicle. P/N 4306.32; M22x1.5 RH threads.

Inner cap nut, inner thread 3/4"x16, outer thread 1-1/8"x16. For use with steel inner dual wheel and aluminum outer dual wheel with 1.31" (1-5/16) to 1.44" (1-7/16) stud standout. P/N 7896R, 7896L (Grade 8).

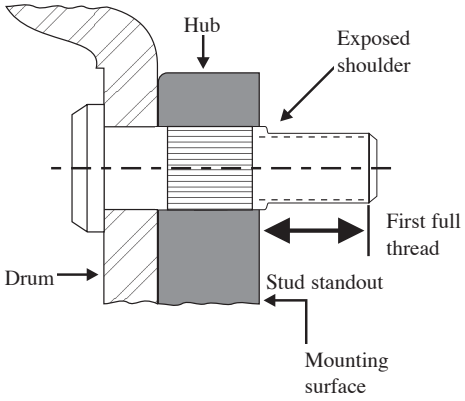
Inner cap nut, inner thread 3/4"x16, outer thread 1-1/8"x16. For use with standard length studs (1.31" [1-5/16] to 1.44" [1-7/16]) stud stand-out) or longer studs not to exceed 1.88" [1-7/8] stud standout. Full internal and external threads. P/N 5978R, 5978L (Grade 8). For studs without exposed shoulders. Do not use with steel inner dualed wheel.

Inner cap nut for use with standard length studs (1.31" [1-5/16] to 1.44" [1-7/16]) stud standout) or longer studs not to exceed 1.88" (1-7/8) stud standout. Full internal and external threads, counter bore 5/16" deep at open end. Prevents stud from bottoming out in cap nut. P/N 5988R, 5988L (Grade 8). For use with studs with exposed shoulders. Do not use with steel inner dualed wheel.

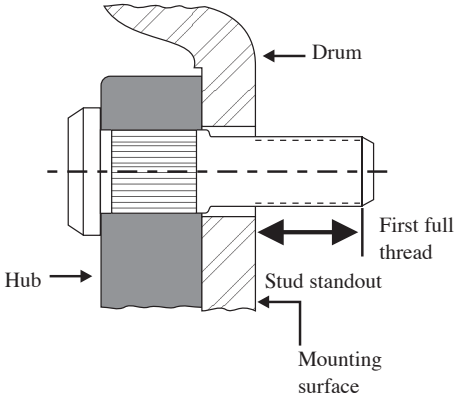
How to measure stud standout

5-3

Stud standout is measured from the axle end mounting surface (the hub, for inboard mounted drums, and the drum, for outboard mounted drums) to the first complete thread at the outside end of the stud.



Inboard mounted drum



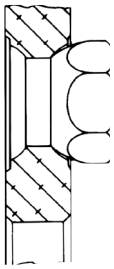
Outboard mounted drum

Stud located ball seats are spherical

5-4

The nut seat for the stud located ball seat mounting system is a precision-machined spherical surface. Cap nuts must be properly manufactured to assure correct seating. Never use one or two-piece flange nuts on a wheel designed with ball seats (see Section 5-11).

Ball seat cap nuts may be obtained from your Alcoa Wheel Distributor.

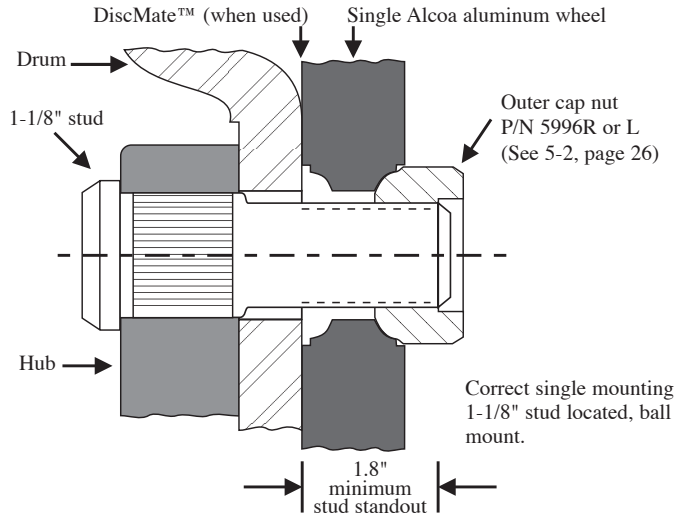


Single and wide base wheel, stud located, ball seat mounting

5-5

Front wheels are mounted as singles and require 1.8-inch (45.7mm) minimum stud standout. Most vehicles have 1-1/8-inch studs on the front hubs. Alcoa single cap nuts, Part Nos. 5996R and 5996L, or equivalents, should be used. Some front hubs have 3/4-inch studs. On these hubs, use Alcoa single cap nuts, Part Nos. 5995R and 5995L or equivalents.

DiscMate™ wheel spacers are recommended for use with Alcoa Dura-Bright® surface treated wheels to protect the wheel contact surfaces from marring. DiscMate™ wheel spacers are placed between the contact surfaces of the Dura-Bright® wheel and the brake drum as shown below and on the next page.



Correct single mounting with 1-1/8" stud located, ball seat mount.

Continued on the next page

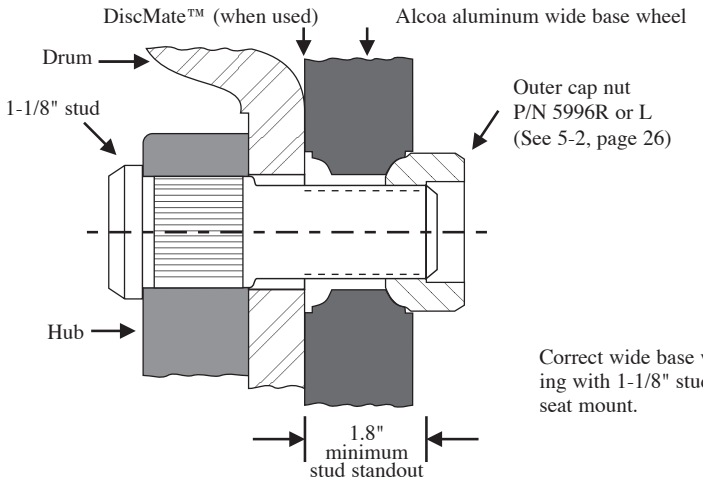
Single and wide base wheel, stud located, ball seat mounting (continued)

NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

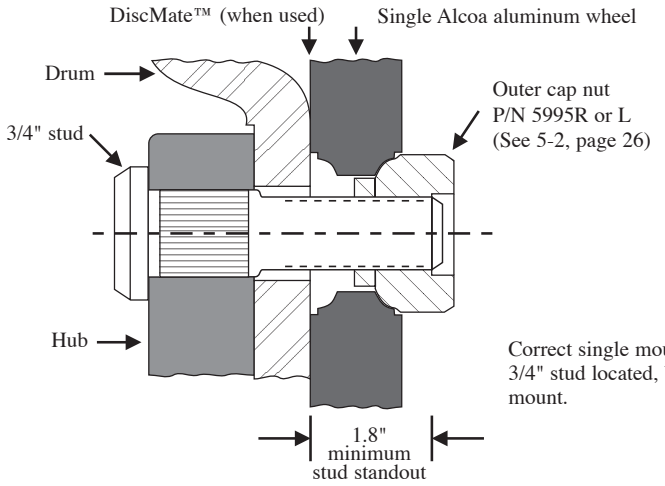
Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: Check for and replace bent, broken, cracked or damaged studs. When replacing broken studs, always replace the studs on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

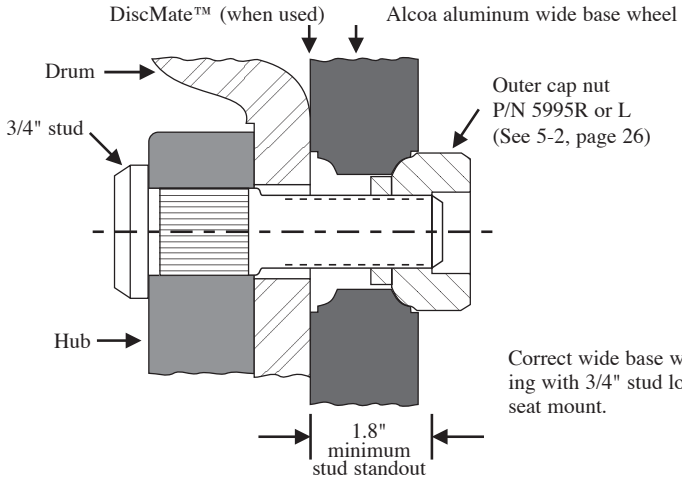
All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.



Correct wide base wheel mounting with 1-1/8" stud located, ball seat mount.



Correct single mounting with 3/4" stud located, ball seat mount.



Correct wide base wheel mounting with 3/4" stud located, ball seat mount.

Dualed wheels, stud located, ball seat mounting

Rear wheels are most frequently mounted as duals. Each inner aluminum wheel is attached by 10 inner cap nuts. Alcoa recommends use of inner cap nuts 5978R, 5978L, or 5988R, 5988L (see 5-2, page 26).

Cap nuts recommended by Alcoa are compatible with Alcoa wheels. Hardware of equal dimensions and strength may be used.

Continued on next page.

5-6

Dualed wheels, stud located, ball seat mounting (continued)

NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: Check for and replace bent, broken, cracked or damaged studs. When replacing broken studs, always replace the studs on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

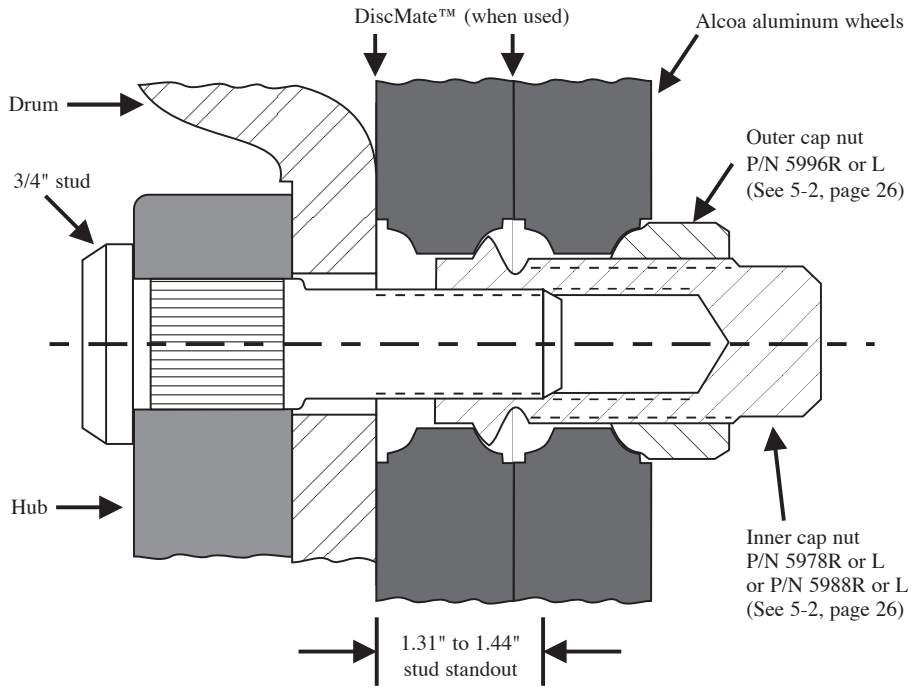
All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.

Most vehicles have standard length studs (1.31-inch [1-5/16-inch] to 1.44-inch [1-7/16-inch] stud standout). Some vehicles use studs longer than standard (up to 1.88-inch [1-7/8-inch] standout).

When changing types of brake drums be sure to check for excessive stud standout (greater than 1.88-inch [1-7/8-inch]). Excessive stud standout may cause the inner cap nut to bottom out on the longer stud preventing proper seating of the wheel.

Each outer dual wheel is attached by 10 single cap nuts which thread on the inner cap nuts. Use Alcoa outer cap nuts, Part Nos. 5996R, 5996L or equivalents. Match mounted dual wheels should be put on the vehicles with the valve stems 180° apart.

DiscMate™ wheel spacers are recommended for use with Alcoa Dura-Bright® surface treated wheels to protect the wheel contact surfaces from marring. DiscMate™ wheel spacers are placed between the contact surfaces of the Dura-Bright® wheel and the brake drum and between the dual aluminum wheels as shown below.



Correct mounting for dual aluminum, stud located / ball seat mount wheels.

WARNING

WARNING Incorrect inner cap nuts used with dualed aluminum wheels can bottom out on the unthreaded portion of the stud before the wheels are properly seated.

Improperly seated wheels can run loose, cause stud breakage and disengage from the vehicle which can cause serious injury or death. Loose running wheels can lead to stud breakage.

Use only cap nut 5978R or L, 5988R or L, or their equivalent when mounting dual aluminum wheels.

On occasion Alcoa aluminum truck wheels are operated dualed with a steel inner wheel. In the event a steel inner wheel is used, extreme care must be exercised to properly seat it to the hub or drum prior to mounting the outer aluminum wheel. Selection of an inner cap nut capable of fixing the steel inner wheel and providing adequate external thread length to secure the outer aluminum dualed wheel is critical to a safe assembly. Alcoa recommends the use of inner cap nuts 7896R and L (Grade 8), or equivalent, for this purpose.

Dualed wheels, steel inner / aluminum outer stud located ball seat mounting (continued)

5-7

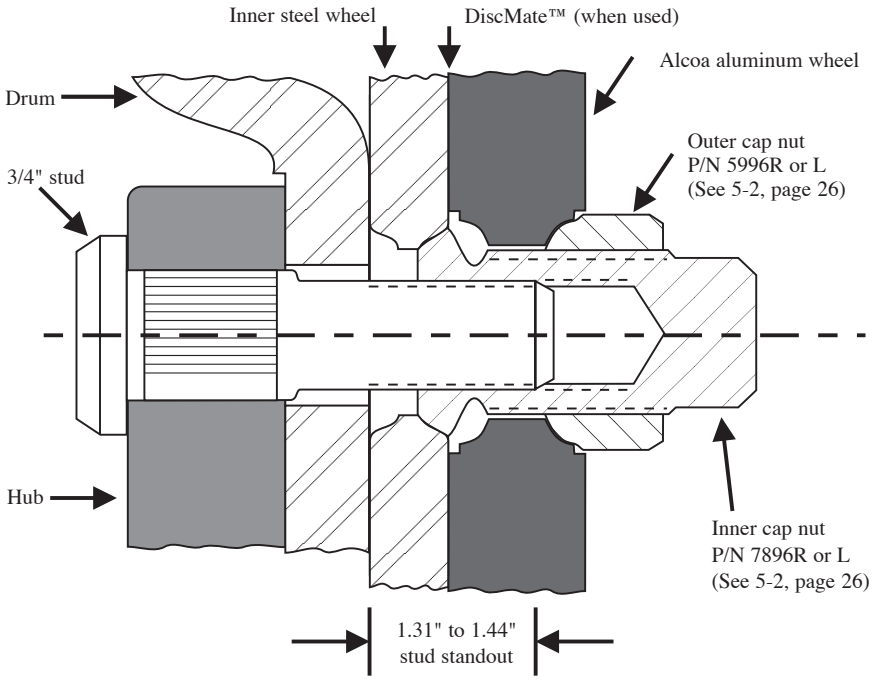
NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: Check for and replace bent, broken, cracked or damaged studs. When replacing broken studs, always replace the studs on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.

DiscMate™ wheel spacers are recommended for use with Alcoa Dura-Bright® surface treated wheels to protect the wheel contact surfaces from marring. DiscMate™ wheel spacers are placed between the contact surfaces of the Dura-Bright® wheel and the brake drum and between the steel and aluminum wheels as shown below.



Correct dual mounting for steel inner/aluminum outer stud located ball seat mount.

WARNING

WARNING Incorrect inner cap nuts used with steel wheels can bottom out on the unthreaded portion of the stud before the wheels are properly seated.

Improperly seated wheels can run loose, cause stud breakage and disengage from the vehicle which can cause serious injury or death. Loose running wheels can lead to stud breakage.

Use only cap nut 7896R or L or its equivalent when mounting steel inner duals.

WARNING

WARNING Inadequate wheel support surface can lead to stud hole-to-stud hole fracture resulting in separation of the outer disc and rim from the vehicle.

Separation of the wheel from the vehicle can cause injury or death.

Alcoa aluminum wheels with 11-1/4-inch diameter bolt circle require a support surface at least 13-3/16-inches in diameter. Check the outer support surface of the inner steel wheel for flatness and adequate diameter before installing the outer wheel. When the wheels are serviced, check the mounting surfaces of both wheels for stud hole to stud hole cracks. If cracks are found, remove the wheel from service. For the support surface diameter required by other bolt circle sizes, ask your Alcoa representative.

WARNING

WARNING Use of two-piece flange nuts on ball seat wheels or ball seat cap nuts on hub piloted wheels is dangerous.

Using the wrong cap nuts can cause loss of torque, broken studs and cracked wheels; conditions which can lead to injury or death.

Use only hardware designed specifically for each wheel type. See Section 4-2 for proper hardware assemblies.

Tightening stud located, ball seat cap nuts

5-8

Cap nuts must be kept tight, and studs and nuts should be checked frequently. Nuts should be retorqued if necessary. At tire changes, nuts and studs should be inspected for cracks and stripped or damaged threads. After each wheel mounting, cap nut torque should be checked with a torque wrench.

Impact wrenches, if used, should be carefully adjusted to apply torques within the limits recommended. Torquing of cap nuts should be done in recommended sequences.

Some states have laws which dictate full thread engagement or thread engagement past the nut body. Make sure you know the laws for the states in which you operate and comply.

WARNING Lubricants should not be applied to the cap nut seat or to the cap nut-to-wheel contact surface.

Oiled seats can lead to over-torquing which can stretch studs causing failure of studs. Failed studs can cause the wheel to disengage from the vehicle, causing injury or death.

Lubricants must be completely removed from the cap nut seats and contact surfaces if applied accidentally.

WARNING Undertorqued cap nuts allow wheels to run loose, pounding out (deforming) the ball seats, fatiguing studs or losing nuts. Overtorquing can stretch studs causing them to fail.

Both under and overtorquing can lead to wheels coming off, causing injury or death.

Check all parts, including wheels, studs and cap nuts. Check mounting faces of wheels, hubs and drums. Check for dirt, corrosion or damage. Remove dirt and rust; replace damaged parts. Follow correct tightening sequences and torque levels.

Continued on next page.

Tightening stud located, ball seat cap nuts (continued)

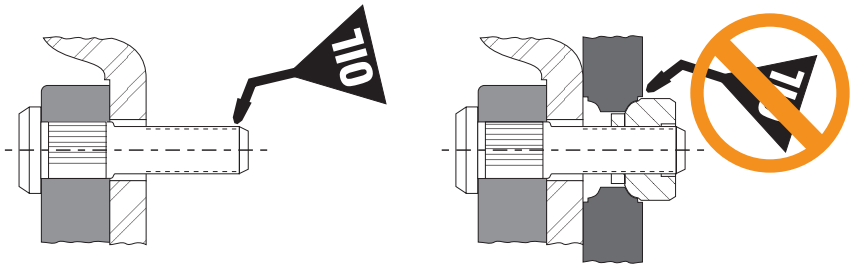
Stud located, ball seat mounting system.

It is recommended that both inner and outer stud threads on stud located mounting systems be lubricated with SAE 30W oil and torqued between 350 and 400 foot-pounds. If threads are not lubricated, torque to between 450 and 500 foot-pounds. Note: when dualing steel wheels with Alcoa aluminum wheels, follow the steel wheel manufacturer's recommendations regarding the proper torque and use of thread lubricants to mount the wheel.

WARNING Application of lubricant to the ball seats can cause excessive torque. Over torque can stretch studs causing them to fail.

Overtorquing can lead to wheel disengagement causing injury or death.

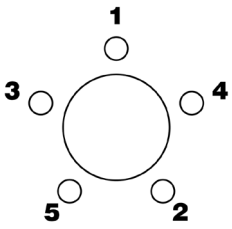
WARNING Do not allow oil to contact ball seats or mounting surfaces of the wheel, hub or drum. Do not use aerosol cans for lubrication of stud threads.



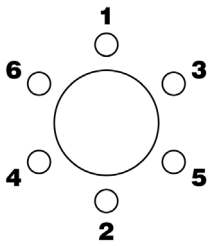
On vehicles equipped to accept wheels manufactured for use with the stud located ball seat mounting system, wheel studs on the right side of the vehicle have right-hand threads and those on the left have left-hand threads. The "R" and "L" on the studs and nuts indicate right and left-hand threads respectively (see Section 5-2).

After mounting a wheel over the studs, snug up the cap nuts in the order shown in the illustrations that follow. After all the cap nuts have been snugged, tighten the cap nuts to the recommended torques, following the same tightening sequence.

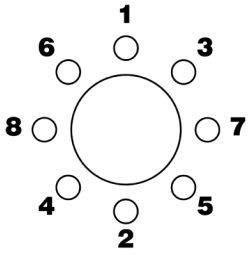
NOTICE: In service, stud dimensions and condition may change over time due to environmental conditions, multiple re-installations, improper torquing and other factors. Consult with your hub and stud manufacturer for maintenance and replacement recommendations.



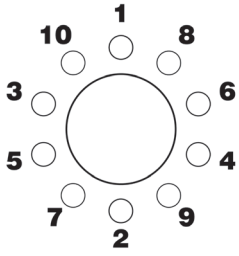
Five Stud



Six Stud



Eight Stud



Ten Stud

Continued on the next page.

Tightening stud located, ball seat cap nuts (continued)

After 5-50 miles of operation or at least the first service opportunity, torque should be rechecked. Loosen outer cap nuts on every other stud to check the torque on inner cap nuts, then retorque outer cap nuts. Repeat steps on remaining studs. Check torque frequently from then on. If nuts require frequent tightening, studs break frequently, or wheel nut seats are pounding out, hardware and mounting practices should be reviewed. Note: whenever the outer cap nut is loosened ALWAYS retorque the inner cap nut before retorquing the outer cap nut.

Single, dualed and wide base wheels, hub piloted mounting, two-piece flange nuts

5-9

Most U.S. manufacturers of highway trucks, tractors and trailers which incorporate the hub piloted wheel mounting system require wheel studs and cap nuts with metric threads. Most frequently these are M22x1.5.

Generally the same diameter stud is used to mount either single or dualed wheels.

Studs on both sides of the vehicle are right-hand threads thereby eliminating the need for flange nuts peculiar to either the right or left side of the vehicle. The same flange nut is used to mount dualed or single wheels. Proper stud standout for single wheels is 2.36-inch (60mm) minimum, dualed wheels require 3.346-inch (85mm) minimum and single wide base wheels require 2.36-inch (60mm).

Some states have laws which dictate full thread engagement or thread engagement past the nut body. Make sure you know the laws for the states in which you operate and comply.

DiscMate™ wheel spacers are recommended for use with Alcoa Dura-Bright® surface treated wheels to protect the wheel contact surfaces from marring. DiscMate™ wheel spacers are placed between the contact surfaces of the Dura-Bright® wheel and the brake drum and between the dual wheels as shown below.

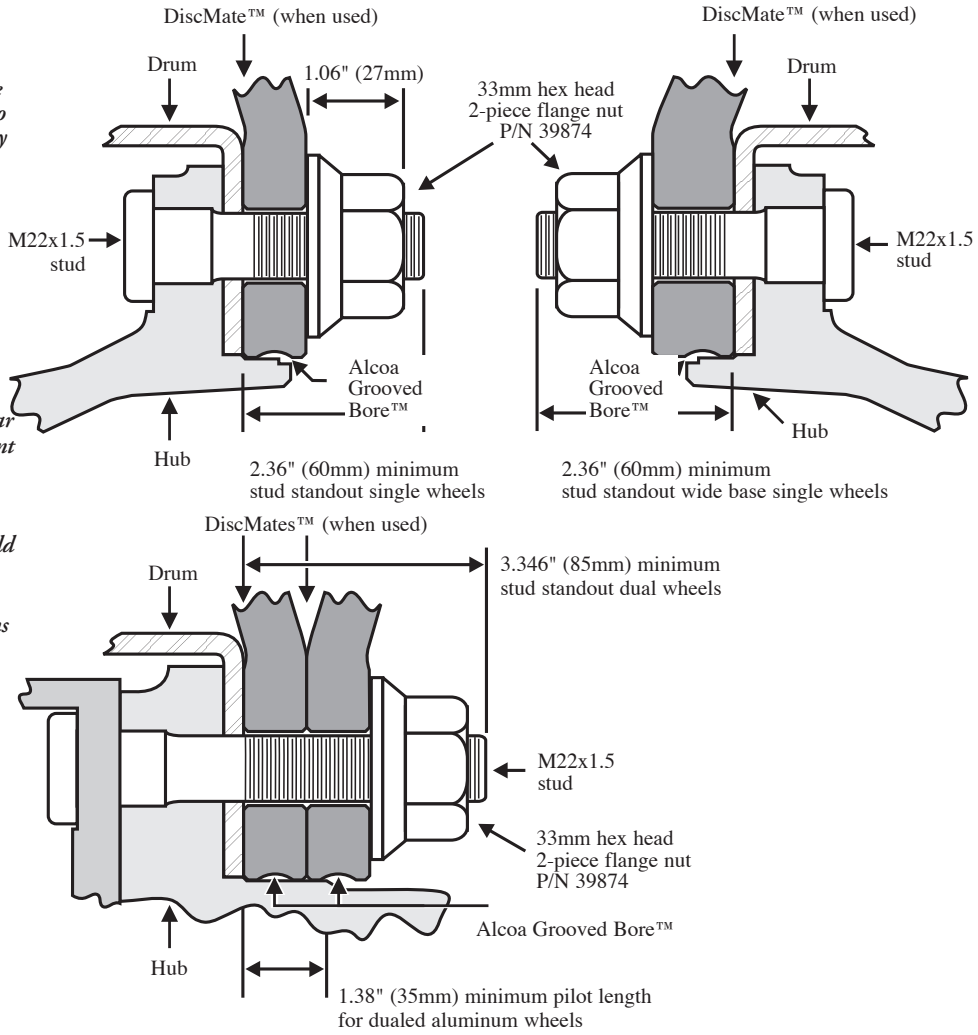
Note: Some stud located ball seat wheels have the same number of holes and bolt circle diameter as hub piloted wheels. They should not be mixed.

NOTICE: Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE: Check for and replace bent, broken, cracked or damaged studs. When replacing broken studs, always replace the studs on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.



Typical assembly of single and dual wheels of hub piloted type with 33mm hex head two-piece flange nut, Part No. 39874. If hex nuts with greater overall height are used, more stud length is required.

Continued on the next page.

Single, dualed and wide base wheels, hub piloted mounting, two-piece flange nuts (continued)

Hubs designed for steel hub piloted wheels may not have enough pilot length to locate dualed aluminum wheels. Pay close attention to pilot length, particularly when converting from steel to aluminum duals. Measure the hub pilot to make sure the hub has a minimum pilot length of 1.38-inch or 35mm for dualed wheels.

When mounting painted steel inner dual wheels with outer aluminum wheels, be cautious of excessive paint build-up on the inner steel wheel. Excessive paint can reduce the clamping force and allow the wheels to become loose.

Match mounted dual wheels should be put on the vehicle with the valve stems 180° apart.

Tightening hub piloted mounting, two-piece flange nuts

Flange nuts must be kept tight, and studs and nuts should be checked frequently. At tire changes, nuts and studs should be inspected to be sure they are in good condition. If nuts require frequent tightening or studs break frequently, hardware and mounting practices should be reviewed.

Impact wrenches, if used, should be carefully adjusted to apply torques within the limits recommended. Torquing of flange nuts should be done in recommended sequences.

WARNING Undertorqued flange nuts allow wheels to run loose and fatigue studs or lose nuts. Overtorquing can stretch studs causing them to fail.

Both under and overtorquing can lead to wheel disengagement causing injury or death.

WARNING Check all parts including wheels, studs and flange nuts. Check mounting faces of wheels, hubs and drums. Check for dirt, corrosion or damage. Remove dirt and rust; replace damaged parts. Follow correct tightening sequences and torque levels.

Two-piece flange nuts with a 33mm hex head design (see Section5-2), used with hub piloted wheels should be tightened to a torque of 450 to 500 foot-pounds. Two-piece flange nuts with 1-1/2-inch hex head design and other designs have different torque requirements. Inquire of the manufacturer for the proper torque values.

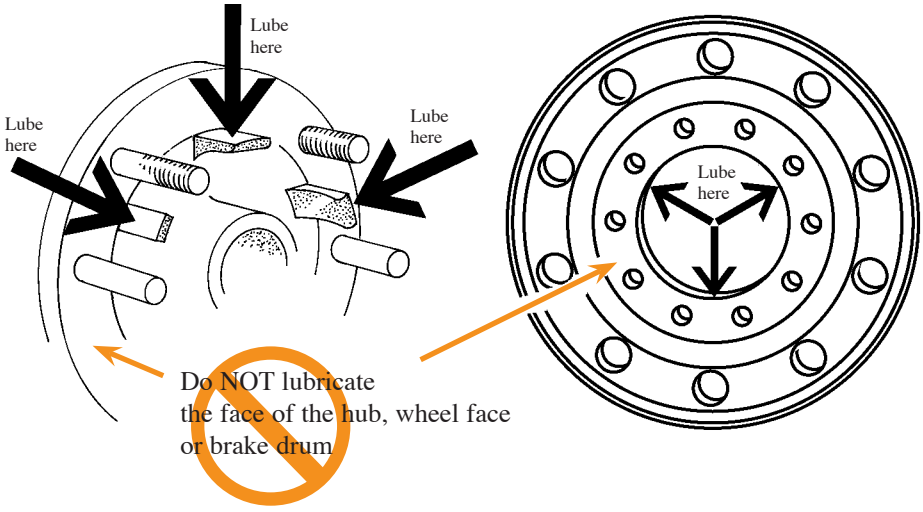
Wheel studs on both the right and left side hubs of vehicles utilizing the hub piloted wheel system have right-hand threads.

Prior to mounting hub piloted wheels, generously coat the wheel pilot or hub pads with a non-water-based lubricant to minimize corrosion product build-up between the wheel and hub pilot. Excessive corrosion build-up between the wheel and hub pilots can make wheel removal difficult. Do not lubricate the face of the wheel, hub or brake drum (see illustration on the next page).

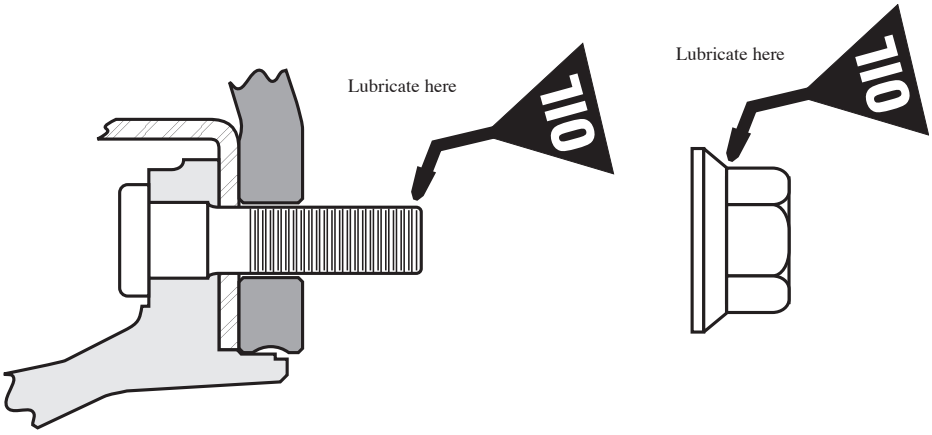
Continued on the next page.

Tightening hub-piloted mounting, two-piece flange nuts (continued)

Lubricate the hub pads or the wheel hub bore generously with a non-water-based lubricant.

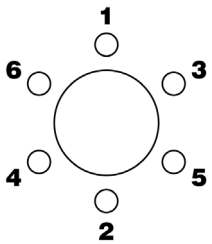


Before installing two-piece flange nuts, lightly lubricate the stud threads and the contact surfaces between the cap nut and the washer as illustrated below with an SAE 30W oil. This will minimize corrosion between the mating surfaces. Lubrication is not necessary with new hardware.

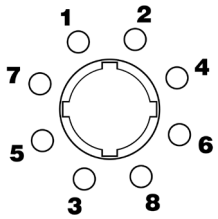


Position one of the hub's pilot pads at the twelve o'clock position. After positioning wheels on the pilot pads, hand tighten all two-piece flange nuts, then tighten to the recommended torque following the proper sequence shown below for your type wheel. After 5-50 miles of operation or at least the first service opportunity, torque should be rechecked. Check torque frequently from then on. If nuts require frequent tightening, studs break frequently, or wheel bolt holes are pounding out, hardware and mounting practices should be reviewed.

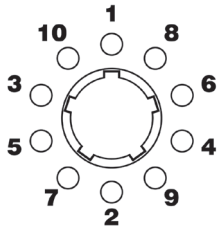
NOTICE: In service, stud dimensions and condition may change over time due to environmental conditions, multiple re-installations, improper torquing and other factors. Consult with your hub and stud manufacturer for maintenance and replacement recommendations.



Six Stud



Eight Stud



Ten Stud

5-11

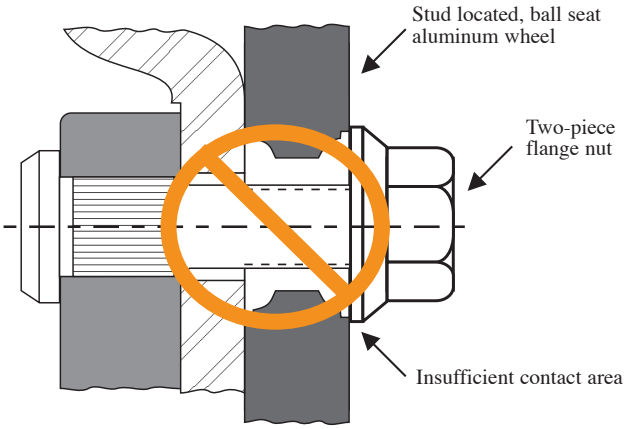
WARNING

WARNING Use of two-piece flange nuts on ball seat wheels, ball seat cap nuts on hub piloted wheels or single-piece flange nuts in place of two-piece flange nuts is dangerous.

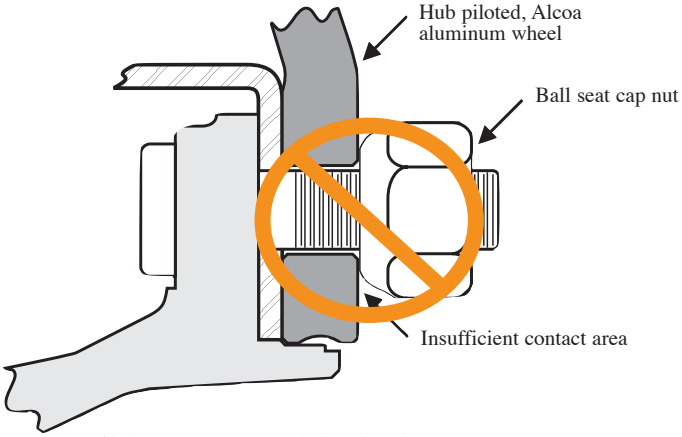
Using the wrong wheel nuts can cause loss of torque, broken studs and cracked wheels, conditions which can lead to injury or death.

Use only hardware designed specifically for each wheel type. See Section 4-2 for proper hardware assemblies.

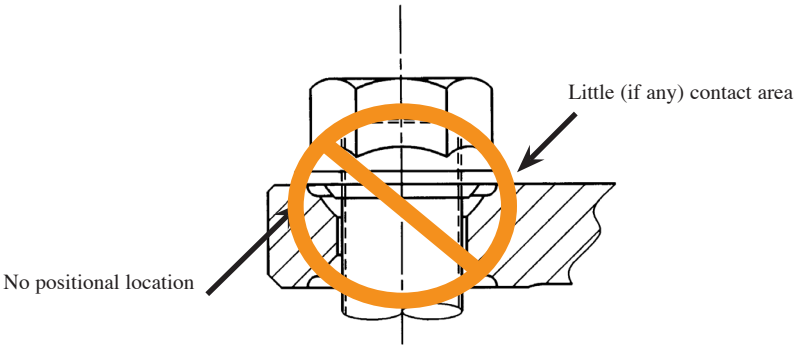
The following are examples of incorrect wheel assemblies.



Do not use two-piece flange nuts with stud located ball seat wheels.



Incorrect use of ball seat cap nut on hub piloted system.
Do not use ball seat cap nuts with hub piloted wheels.



Incorrect use of flange nut positioned on Alcoa ball seat wheel.
Do not use any flange nut on Alcoa aluminum ball seat wheels.

6 Proper Torque, Wheel Identification and Valves

Avoid abuse

6-1

Abuse can shorten the life of a wheel. Lack of care in changing a tire, heavy pounding of the wheel rim, overloading, exposure to excessive heat or hitting curbs at high speed or a sharp angle can damage wheels.

Do not overinflate. Use the tire manufacturer's recommended pressure, but under no circumstances exceed cold tire pressures listed in Section 2 Specifications of this manual. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

Keep wheel nuts tight

6-2

Wheel cap nuts must be kept tight (see Section 5-8). When checking the cap nuts on dual disc wheels utilizing the stud located ball seat mounting system, loosen every other outer cap nut and then check the torque of the inner cap nuts. Retorque the loosened outer cap nuts. Repeat procedure with the rest of the nuts. Check all cap nuts for proper torque after the first use or any removal. Inspect wheels and check wheel nuts during service stops (see Section 3). Dirt streaks from cap nuts may indicate looseness.

Flange nuts must be kept tight, and studs and nuts should be checked frequently. At tire changes nuts and studs should be inspected to be sure they are in good condition. If nuts require frequent tightening or studs break frequently, hardware and mounting practices should be reviewed.

For proper nut torque, refer to the chart below:

Mount Type	Nut Thread	Torque Level Ft-Lb Lubricated*	Torque Level Ft-Lb Dry*
Hub piloted using two-piece flange nut	11/16" - 16 M20 x 1.5 M22 x 1.5	300-400 280-330 450-500	
Stud piloted, double cap nut standard type (7/8" radius)	3/4" - 16 1-1/8" - 16	350-400 350-400	450-500 450-500
Stud piloted, double cap nut heavy duty type (1-3/16" radius)	15/16" - 12 1-1/8" - 16 1-5/16" - 12	650-800	750-900 750-900 750-900

*For nuts used on hub piloted wheels, apply two drops of oil to the point between the nut and flange and two drops to the first two or three threads at the tip of each stud (see Section 5-10).

For nuts used on stud piloted wheels, apply two drops of oil to the first two or three threads at the tip of each stud only (see Sections 5-8).

NOTE:

1. If using specialty fasteners (cap nuts), consult the manufacturer for recommended torque values.

2. Tightening wheel nuts to their specified torque is extremely important. Undertightening which results in loose wheels can damage wheels, studs and hubs, and can result in wheel loss. Overtightening can damage studs, nuts and wheels and results in loose wheels as well.

3. Regardless of the torque method used, all torque wrenches, air wrenches and any other tools should be calibrated periodically to ensure the proper torque is applied.

Balance weights (clip-on)

6-3

Balance weights for Alcoa wheels are available from your Alcoa Wheel Distributor. With radial tires it may be necessary to temporarily reduce the tire pressure when installing clip-on weights to allow clearance of the weight clamp over the rim flange. Use of coated balance weights is recommended to avoid staining and corrosion of the aluminum wheel surface.

Excessive rim flange wear (see Section 3-12) could dictate the use of "stick-on" or adhesive wheel weights if there is inadequate rim to properly hold a clip-on style weight.

Improperly installed weights could "fly off" during use and damage the vehicle or cause personal injury. Always follow the recommended procedures in this manual or the wheel weight manufacturers. Adhesive weights should be applied only to a clean surface on the brake side of the wheel rim. These weights should be installed only in a location where they will not contact the brake components during vehicle operation.

Owner/in-service identification

6-4

Some fleets wish to specially identify wheels as to OWNERSHIP and IN-SERVICE dates. Alcoa recommends that fleets and owner-operators adopt the practice of permanently stamping wheels with the date they are first placed into service.

1. Use "Lo-Stress" stamps or equivalent.

2. Location of stamped areas on outside disc should be in space outward from a line between hand hole centers and a minimum of one inch from the periphery of any hand hole.

3. Location of stamped identification on inside of wheel should be as close to the factory identification stamping as possible.

Note: Use of an impression stamp on Dura-Bright® surface treated wheels can affect the appearance and performance of the Dura-Bright® surface treatment local to the stamp.

Valves

6-5

Alcoa drop center wheels for tubeless tires come from the factory with air valves installed. If it becomes necessary to replace an air valve, install it using the following torque values.

10-14 foot-pounds for Part Numbers	7-11 foot-pounds for Part Numbers
TR 509 TR 510 TR 511	TR 542 or 552 Series TR 543 or 553 Series TR 544 or 554 Series TR 545 or 545 Series 60MS27N 70MS7

Replacement valves may be obtained from your authorized Alcoa Wheel Distributor. Always use silicone o-rings or grommets – not rubber – when reinstalling valve stems. Metal valve stem caps are recommended instead of plastic. It is recommended that valve stems with o-rings or grommets be replaced at every tire change.

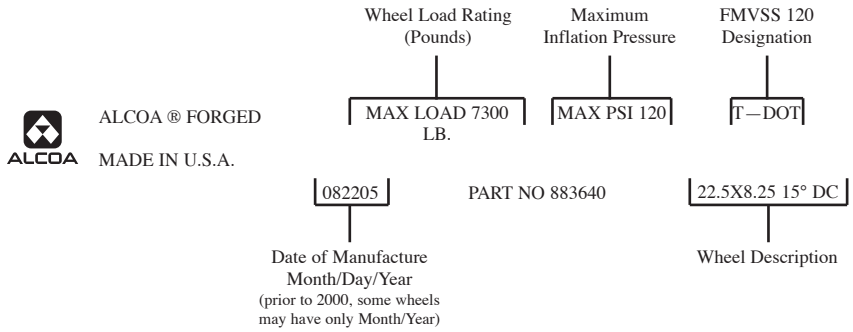
When replacing valve stems, it is recommended to lubricate the threads and o-ring with a non-water-based tire lubricant.

When valve stem extensions are used, it is recommended that valve stem stabilizers be used.

Alcoa wheel identification

Since 1977, all Alcoa aluminum disc wheels have been identified with a stamp that shows the wheel load rating, maximum inflation pressure, date of manufacture, part number, wheel description and DOT marking designation.

Prior to June 1996, all Alcoa heavy duty truck wheels had the Alcoa identification symbol ⧖ on the outside of the disc near the hand hole in line with the valve location. This marking was phased out on heavy duty truck wheels manufactured after June 1996.



All Dura-Bright® surface treated wheels are designated by the letters “DB” following the part number such as 883640DB.

Note: Dura-Bright® wheels produced after November 2002 have Alcoa wheel part numbers ending with “DB” (earlier wheels have part numbers ending in a 4 or 7) with bead seat diameters measured in 0.5-inch increments. Not all Alcoa wheels are available with the Dura-Bright® surface treatment.

All Dura-Flange® wheels are designated by the letters “DF” following the part number such as 883640DF.

7 OSHA Regulations

OSHA Regulations

7-1

Sec. 1910.177 Servicing multi-piece and single piece rim wheels.

(a) Scope

(1) This section applies to the servicing of multi-piece and single piece rim wheels used on large vehicles such as trucks, tractors, trailers, buses and off-road machines. It does not apply to the servicing of rim wheels used on automobiles, or on pickup trucks and vans utilizing automobile tires or truck tires designated "LT".

(2) This section does not apply to employers and places of employment regulated under the Construction Safety Standards, 29 CFR part 1926; the Agriculture Standards, 29 CFR part 1928; the Shipyard Standards, 29 CFR part 1915; or the Longshoring Standards, 29 CFR part 1918.

(3) All provisions of this section apply to the servicing of both single piece rim wheels and multi-piece rim wheels unless designated otherwise.

(b) Definitions

Barrier means a fence, wall or other structure or object placed between a single piece rim wheel and an employee during tire inflation, to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel.

Charts means the U.S. Department of Labor, Occupational Safety and Health Administration publications entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-piece Rim Matching Chart," the National Highway Traffic Safety Administration (NHTSA) publications entitled "Demounting and Mounting Procedures Truck/Bus Tires" and "Multi-piece Rim Matching Chart," or any other poster which contains at least the same instructions, safety precautions and other information contained in the charts that is applicable to the types of wheels being serviced.

Installing a rim wheel means the transfer and attachment of an assembled rim wheel onto a vehicle axle hub. Removing means the opposite of installing.

Mounting a tire means the assembly or putting together of the wheel and tire components to form a rim wheel, including inflation. Demounting means the opposite of mounting.

Multi-piece rim wheel means the assemblage of a multi-piece wheel with the tire tube and other components.

Multi-piece wheel means a vehicle wheel consisting of two or more parts, one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated.

Restraining device means an apparatus such as a cage, rack, assemblage of bars and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel, or during the sudden release of the contained air of a single piece rim wheel.

Rim manual means a publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced.

Rim wheel means an assemblage of tire, tube and liner (where appropriate), and wheel components.

Service or servicing means the mounting and demounting of rim wheels, and related activities such as inflating, deflating, installing, removing, and handling.

Service area means that part of an employer's premises used for the servicing of rim wheels, or any other place where an employee services rim wheels.

Single piece rim wheel means the assemblage of single piece rim wheel with the tire and other components.

Single piece wheel means a vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated.

Trajectory means any potential path or route that a rim wheel component may travel during an explosive separation, or the sudden release of the pressurized air, or an area at which an airblast from a single piece rim wheel may be released. The trajectory may deviate from paths which are perpendicular to the assembled position of the rim wheel at the time of separation or explosion. (See appendix A for examples of trajectories.)

Wheel means that portion of a rim wheel which provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (i.e., the tire and/or tube).

(c) Employee Training

(1) The employer shall provide a program to train all employees who service rim wheels in the hazards involved in servicing those rim wheels and the safety procedures to be followed.

(i) The employer shall assure that no employee services any rim wheel unless the employee has been trained and instructed in correct procedures of servicing the type of wheel being serviced, and in the safe operating procedures described in paragraphs (f) and (g) of this section.

(ii) Information to be used in the training program shall include, at a minimum, the applicable data contained in the charts (rim manuals) and the contents of this standard.

(iii) Where an employer knows or has reason to believe that any of his employees is unable to read and understand the charts or rim manual, the employer shall assure that the employee is instructed concerning the contents of the charts and rim manual in a manner which the employee is able to understand.

(2) The employer shall assure that each employee demonstrates and maintains the ability to service rim wheels safely, including performance of the following tasks:

(i) Demounting of tires (including deflation);

(ii) Inspection and identification of the rim wheel components;

(iii) Mounting of tires (including inflation with a restraining device or other safeguard required by this section);

(iv) Use of the restraining device or barrier, and other equipment required by this section;

(v) Handling of rim wheels;

(vi) Inflation of the tire when a single piece rim wheel is mounted on a vehicle;

(vii) An understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the rim wheel following inflation; and

(viii) Installation and removal of rim wheels.

(3) The employer shall evaluate each employee's ability to perform these tasks and to service rim wheels safely, and shall provide additional training as necessary to assure that each employee maintains his or her proficiency.

(d) Tire servicing equipment.

(1) The employer shall furnish a restraining device for inflating tires on multi-piece wheels.

(2) The employer shall provide a restraining device or barrier for inflating tires on single piece wheels unless the rim wheel will be bolted onto a vehicle during inflation.

(3) Restraining devices and barriers shall comply with the following requirements:

(i) Each restraining device or barrier shall have the capacity to withstand the maximum force that would be transferred to it during a rim wheel separation occurring at 150 percent of the maximum tire specification pressure for the type of rim wheel being serviced.

(ii) Restraining devices and barriers shall be capable of preventing the rim wheel components from being thrown outside or beyond the device or barrier for any rim wheel positioned within or behind the device;

(iii) Restraining devices and barriers shall be visually inspected prior to each day's use and after any separation of the rim wheel components or sudden release of contained air. Any restraining device or barrier exhibiting damage such as the following defects shall be immediately removed from service:

(A) Cracks at welds;

(B) Cracked or broken components;

(C) Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation;

(D) Pitting of components due to corrosion; or

(E) Other structural damage which would decrease its effectiveness.

(iv) Restraining devices or barriers removed from service shall not be returned to service until they are repaired and reinspected. Restraining devices or barriers requiring structural repair such as component replacement or rewelding shall not be returned to service until they are certified by either the manufacturer or a Registered Professional Engineer as meeting the strength requirements of paragraph (d)(3)(i) of this section.

(4) The employer shall furnish and assure that an air line assembly consisting of the following components be used for inflating tires:

(i) A clip-on chuck;

(ii) An in-line valve with a pressure gauge or a presettable regulator; and

(iii) A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.

(5) Current charts or rim manuals containing instructions for the type of wheels being serviced shall be available in the service area.

(6) The employer shall furnish and assure that only tools recommended in the rim manual for the type of wheel being serviced are used to service rim wheels.

(e) Wheel component acceptability.

(1) Multi-piece wheel components shall not be interchanged except as provided in the charts or in the applicable rim manual.

(2) Multi-piece wheel components and single piece wheels shall be inspected prior to assembly. Any wheel or wheel component which is bent out of shape, pitted from corrosion, broken, or cracked shall not be used and shall be marked or tagged unserviceable and removed from the service area. Damaged or leaky valves shall be replaced.

(3) Rim flanges, rim gutters, rings, bead seating surfaces and the bead areas of tires shall be free of any dirt, surface rust, scale or loose or flaked rubber build-up prior to mounting and inflation.

(4) The size (bead diameter and tire/wheel widths) and type of both the tire and the wheel shall be checked for compatibility prior to assembly of the rim wheel.

(f) Safe operating procedure - multi-piece rim wheels.

The employer shall establish a safe operating procedure for servicing multi-piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

(1) Tires shall be completely deflated before demounting by removal of the valve core.

(2) Tires shall be completely deflated by removing the valve core before a rim wheel is removed from the axle in either of the following situations:

(i) When the tire has been driven underinflated at 80 percent or less of its recommended

pressure, or

(ii) When there is obvious or suspected damage to the tire or wheel components.

(3) Rubber lubricant shall be applied to bead and rim mating surfaces during assembly of the wheel and inflation of the tire, unless the tire or wheel manufacturer recommends against it.

(4) If a tire on a vehicle is underinflated but has more than 80 percent of the recommended pressure, the tire may be inflated while the rim wheel is on the vehicle provided remote control inflation equipment is used, and no employees remain in the trajectory during inflation.

(5) Tires shall be inflated outside a restraining device only to a pressure sufficient to force the tire bead onto the rim ledge and create an airtight seal with the tire and bead.

(6) Whenever a rim wheel is in a restraining device the employee shall not rest or lean any part of his body or equipment on or against the restraining device.

(7) After tire inflation, the tire and wheel components shall be inspected while still within the restraining device to make sure that they are properly seated and locked. If further adjustment to the tire or wheel components is necessary, the tire shall be deflated by removal of the valve core before the adjustment is made.

(8) No attempt shall be made to correct the seating of side and lock rings by hammering, striking or forcing the components while the tire is pressurized.

(9) Cracked, broken, bent or otherwise damaged rim components shall not be reworked, welded, brazed, or otherwise heated.

(10) Whenever multi-piece rim wheels are being handled, employees shall stay out of the trajectory unless the employer can demonstrate that performance of the servicing makes the employee's presence in the trajectory necessary.

(11) No heat shall be applied to a multi-piece wheel or wheel component.

(g) Safe operating procedure - single piece rim wheels.

The employer shall establish a safe operating procedure for servicing single piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

(1) Tires shall be completely deflated by removal of the valve core before demounting.

(2) Mounting and demounting of the tire shall be done only from the narrow ledge side of the wheel. Care shall be taken to avoid damaging the tire beads while mounting tires on wheels. Tires shall be mounted only on compatible wheels of matching bead diameter and width.

(3) Nonflammable rubber lubricant shall be applied to bead and wheel mating surfaces before assembly of the rim wheel, unless the tire or wheel manufacturer recommends against the use of any rubber lubricant.

(4) If a tire changing machine is used, the tire shall be inflated only to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine.

(5) If a bead expander is used, it shall be removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat).

(6) Tires may be inflated only when contained within a restraining device, positioned behind a barrier or bolted on the vehicle with the lug nuts fully tightened.

(7) Tires shall not be inflated when any flat, solid surface is in the trajectory and within one foot of the sidewall.

(8) Employees shall stay out of the trajectory when inflating a tire.

(9) Tires shall not be inflated to more than the inflation pressure stamped in the sidewall unless a higher pressure is recommended by the manufacturer.

(10) Tires shall not be inflated above the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange.

(11) No heat shall be applied to a single piece wheel.

(12) Cracked, broken, bent, or otherwise damaged wheels shall not be reworked, welded, brazed, or otherwise heated.

[GRAPHIC] [TIFF OMITTED] TC27OC91.036

Appendix B - Ordering Information for NHTSA Charts

OSHA has printed two charts entitled “Demounting and Mounting Procedures for Truck/Bus Tires” and “Multi-piece Rim Matching Chart,” as part of a continuing campaign to reduce accidents among employees who service large vehicle rim wheels.

Reprints of the charts are available through the Occupational Safety and Health Administration (OSHA) Area and Regional Offices. The address and telephone number of the nearest OSHA office can be obtained by looking in the local telephone directory under U.S. Government, U.S. Department of Labor, Occupational Safety and Health Administration.

Single copies are available without charge.

Individuals, establishments and other organizations desiring single or multiple copies of these charts may order them from the OSHA Publications Office, U.S. Department of Labor, Room N-3101, Washington, DC 20210, Telephone (202) 219-4667.

[49 FR 4350, Feb. 3, 1984, as amended at 52 FR 36026, Sept. 25, 1987; 53 FR 34737, Sept. 8, 1988; 61 FR 9239, Mar. 7, 1996]

8 Glossary of Common Terms

Glossary of Common Terms

8-1

1/2 DUAL SPACING - One half the distance between the two center lines of dualed wheels. The dimension is the same as the OUTSET dimension.

1-PIECE FLANGE NUT - A one-piece washer and nut combination not recommended for use on any Aloca wheel application.

2-PIECE FLANGE NUT - A two-piece washer and nut combination used to secure hub piloted wheels.

AIR CHAMBER - The space enclosed by a tire and wheel rim or inner tube.

BEAD SEAT - The area along the outer edges of the rim where the mounted tire and rim are in contact.

BOLT CIRCLE - The circle defined by the centers of the bolt holes (stud holes) of a wheel, dimensions stated in diameter inches or millimeters.

BOLT HOLE - Hole found in the disc of the wheel through which the bolt (stud) passes.

BORE - See “HUB BORE.”

CENTER BORE - See “HUB BORE.”

CONE LOCK CAP NUT - See “2-PIECE FLANGE NUT.”

DC - Abbreviation for drop center.

DISC AREA - The vertical wheel face which supports the rim.

DISC WHEEL - A one-piece (forged) or two-piece (welded) assembly of a disc and a rim.

DROP CENTER - The well or center portion of the wheel rim.

FLAT BASE WHEEL - A multi-piece wheel with a removable side ring.

FOOT-POUNDS - The measure of the amount of torque applied to a cap nut or other part. May be measured with a torque wrench.

GUTTER FLANGE - A groove which supports the removable portion of a multi-piece wheel.

HUB BORE - The center hole of a disc wheel, dimensions stated in diameter inches or millimeters.

HUB PILOTED MOUNTING - A wheel mounting system which uses the hub to center the wheel and two-piece flange nuts to secure it.

in. - Abbreviation for inches.

INNER CAP NUT - Cap nut used to mount the inner wheel in a dualed stud located wheel system.

INSET - The distance from the wheel mounting surface to the rim centerline when the centerline is placed inboard of the mounting surface.

kg - Abbreviation for kilogram (weight measurement), equal to 1000 grams.

kPa - Abbreviation for kilo Pascals (pressure measurement).

Glossary of Common Terms (continued)

LOCK RING - The third piece of a three rim assembly which positions and supports the side ring to the rim base.

MAXIMUM INFLATION - The highest amount of air pressure allowed, measured at normal ambient temperatures.

mm - Abbreviation for millimeters.

MULTI-PIECE WHEEL - A wheel assembly in which the rim portion of the wheel consists of two or more separate parts.

N-m - Abbreviation for Newton meters

OFFSET - See "OUTSET."

OPEN SIDE - The side of the wheel opposite the disc face.

OSHA - Abbreviation for the U.S. Department of Labor, Occupational Health and Safety Administration.

OUTER CAP NUT - A cap nut used to secure the outer stud located wheel in a dualed wheel pair and thread onto the inner cap nut.

OUTSET - The distance from the mounting surface of the wheel to the rim centerline when the rim centerline is mounted outboard of the hub face. This dimension is the same as the 1/2 DUAL SPACING dimension.

PILOT PAD - The raised surfaces on a hub used to center a hub piloted wheel.

PSI - Abbreviation for pounds per square inch.

REVERSIBLE - Term applied to a disc wheel which can be reversed on the hub without changing the position of the tire centerline.

RIM CENTERLINE - A line to the radial axis of the wheel running through the mid point between the rim flanges.

RIM FLANGE - That portion of the rim which extends above the rim surface which retains the tire bead.

RIM - That portion of the wheel which supports the tire.

SIDE RING - A removable piece of a multi-piece wheel assembly which provides lateral support for one tire bead.

SINGLE CAP NUT - A cap nut used to secure single wheels or outer dual wheels.

STUD - A threaded bolt extending from the hub surface to which the wheels are secured by the cap nuts.

STUD LOCATED, BALL SEAT MOUNTING - A wheel mounting system which uses the studs and spherical ball seat cap nuts to center and secure the wheel.

TIRE BEAD - That surface of the tire which contacts the angled surface of the wheel rim.

TORQUE - The amount of force used to tighten cap nuts. Usually stated in foot-pounds or kilograms and measured with a torque wrench.

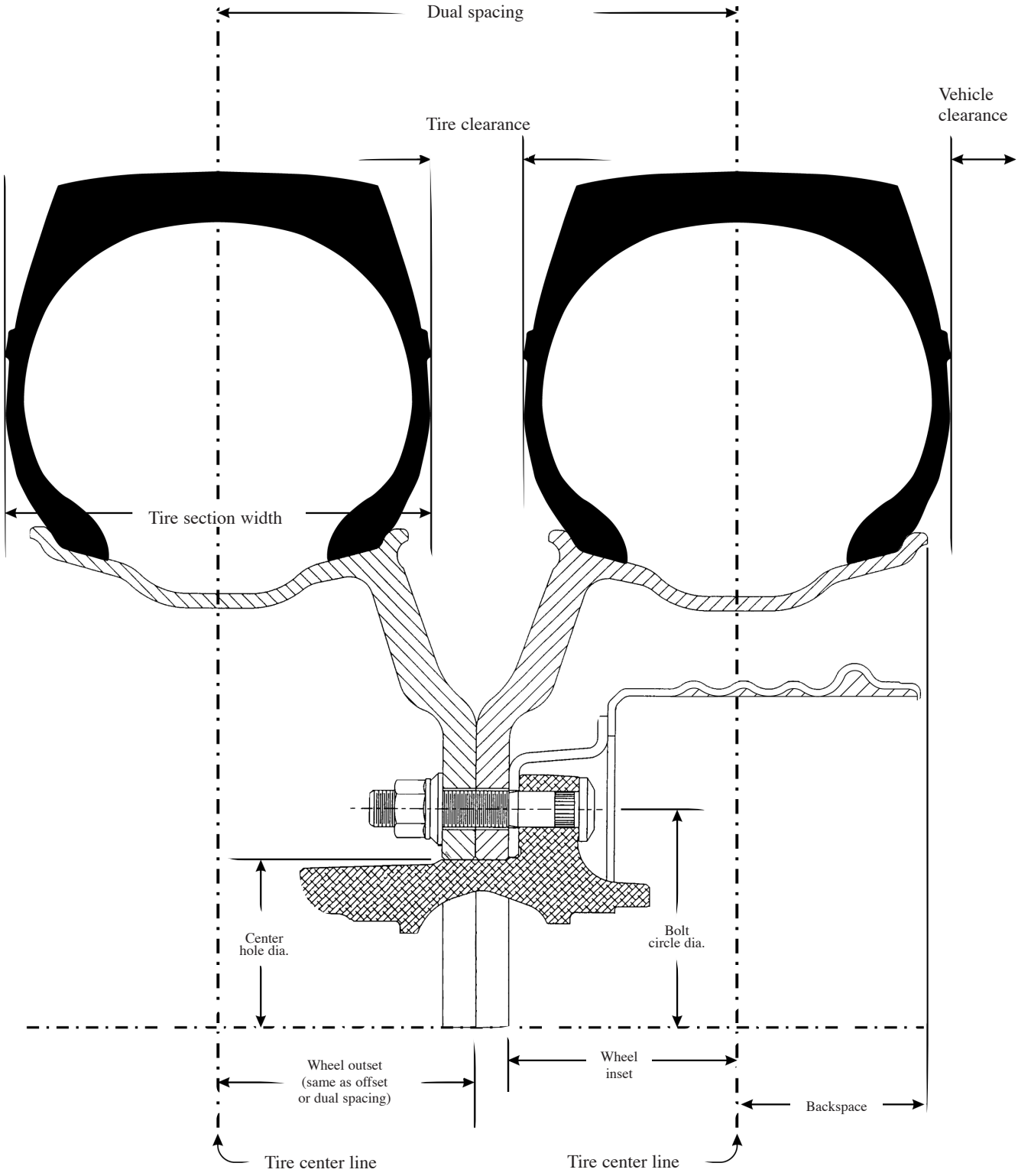
WHEEL MOUNTING FACE - That portion of the wheel face which contacts the hub or brake drum.

wt. - Abbreviation for weight.

8-2

How to measure minimum dual spacing

Minimum dual spacing measurement is determined by the tire manufacturer and may be obtained from the tire manufacturer's handbook. To determine if the Alcoa aluminum dual wheel assembly has adequate minimum dual spacing for the selected tires, double the wheel outset measurement of the Alcoa wheel used. If the doubled outset measurement is equal to or greater than the tire manufacturer's recommendation, there will be sufficient minimum dual spacing. Wheel inset and outset is given for each Alcoa wheel on pages 2 and 3. Both inset and outset wheels are measured from the mounting surface of the wheel to the center line of the rim. Maintaining proper tire inflation and load ratings are essential to maintaining proper minimum dual spacing.



9 Conversion Tables

Inch Fraction, Decimal and Millimeter Equivalents Chart (Up to 1 inch)

9-1

Inches	Decimals	Millimeters
1/64	0.0156	0.3969
1/32	0.0313	0.7938
3/64	0.0469	01.1906
1/16	0.0625	1.5875
5/64	0.0781	1.9844
3/32	0.0938	2.3813
7/64	0.1094	2.7781
1/8	**0.1250**	**3.1750**
9/64	0.1406	3.5719
5/32	0.1563	3.9688
11/64	0.1719	4.3656
3/16	0.1875	4.7625
13/64	0.2031	5.1594
7/32	0.2188	5.5563
15/64	0.2344	5.9531
1/4	**0.2500**	**6.3500**
17/64	0.2656	6.7469
9/32	0.2813	7.1438
19/64	0.2969	7.5406
5/16	0.3125	7.9375
21/64	0.3281	8.3344
11/32	0.3438	8.7313
23/64	0.3594	9.1281
3/8	**0.3750**	**9.5250**
25/64	0.3906	9.9219
13/32	0.4063	10.3188
27/64	0.4219	10.7156
7/16	0.4375	11.1125
29/64	0.4531	11.5094
15/32	0.4688	11.9063
31/64	0.4844	12.3031
1/2	**0.5000**	**12.7000**

Inches	Decimals	Millimeters
33/64	0.5156	13.0969
17/32	0.5313	13.4938
35/64	0.5469	13.8906
9/16	0.5625	14.2875
37/64	0.5781	14.6844
19/32	0.5938	15.0813
39/64	0.6094	15.4781
5/8	**0.6250**	**15.8750**
41/64	0.6406	16.2719
21/32	0.6563	16.6688
43/64	0.6719	17.0656
11/16	0.6875	17.4625
45/64	0.7031	17.8594
23/32	0.7188	18.2563
47/64	0.7344	18.6531
3/4	**0.7500**	**19.0500**
49/64	0.7656	19.4469
25/32	0.7813	19.8438
51/64	0.7969	20.2406
13/16	0.8125	20.6375
53/64	0.8281	21.0344
27/32	0.8438	21.4313
55/64	0.8594	21.8281
7/8	**0.8750**	**22.2250**
57/64	0.8906	22.6219
29/32	0.9063	23.0188
59/64	0.9219	23.4156
15/16	0.9375	23.8125
61/64	0.9531	24.2094
31/32	0.9688	24.6063
63/64	0.9844	25.0031
1	**1.000**	**25.4000**

Conversion Factors

9-2

Inches to Millimeters

Inches	x	25.4	=	Millimeters

Millimeters to Inches

Millimeters	x	0.03937	=	Inches

PSI to kPa

PSI	x	6.8948	=	kPa

kPa to PSI

kPa	x	0.145	=	PSI

Pounds to Kilograms

Pounds	x	0.4536	=	kg

Kilograms to Pounds

kg	x	2.2050	=	Pounds

Foot-pounds to Newton Meters

Ft-lbs	x	0.135582	=	N-m

Newton Meters to Foot-pounds

N-m	x	.737561	=	Ft-lbs

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